

Air Quality Update And Screening Assessment Report 2006



**Larne
Borough
Council**



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Executive Summary

Local air quality management was introduced by the first air quality strategy in 1997. Following review the UK National Air Quality Strategy was published in 2000, with the aim of improving air quality in the UK.

Local authorities have a major role in this process, which was formalized as a statutory duty in the Environment (Northern Ireland) 2002.

The first stage of Larne Borough Council's review and assessment of air quality, which identifies the main sources of seven key pollutants, was published in July 2001.

This was followed by the Second and Third Stage Review and Assessment, published in June 2004, which further scrutinized three pollutants which were potentially of concern, namely nitrogen dioxide, sulphur dioxide and particulates. This report concluded that it was unlikely that the air quality objectives would be exceeded and it was not necessary for Larne Borough Council to declare and Air Quality Management Areas.

This Updating and Screening Report looks at any changes that may have occurred since the First Stage Review which may have affected the seven prescribed pollutants and identifies if more detailed assessments are required.

The Updating and Screening Assessment of air quality in Larne Borough has concluded that for each of the seven key air pollutants the air quality objectives are likely to be met and that a more detailed assessment is not required.

However, monitoring of sulphur dioxide and particulate matter from domestic emissions will continue in the area of Larne town predicated to have the highest concentration of pollutants, as monitoring only commenced in January 2006.

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1.0 Introduction

1.1 The Air Quality Issue

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

1.2 Phased Approach to LAQM

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

2.0 Legislative Background

2.1 The Environment (Northern Ireland) Order 2002

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

2.2 National Air Quality Strategy

The Environment Act 1995 – Part IV Section 80 required the Secretary of State to publish a strategy containing policies with respect to the assessment and management of the quality of air, i.e. a National Air Quality Strategy (NAQS). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in January 2000. The primary objective of the strategy is to ensure that everyone is able to enjoy a level of ambient air quality in public places which poses no significant risk to health and quality of life. It sets out air quality objectives for 8 pollutants, the date by which they should be achieved and the policy framework which is to be adopted to achieve the objectives. Pollutants covered by the strategy are: benzene, 1,3 butadiene, carbon monoxide, lead, oxides of nitrogen, particulate matter (as PM₁₀) and sulphur dioxide.

2.3 Air Quality Regulations (Northern Ireland) 2003

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

The Air Quality Regulations specify the following objectives

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

*µg/m³: micrograms per cubic metre

3.0 Description of Council Area

Larne Borough is situated on the east coast of Northern Ireland and is often described as 'The Gateway to Ulster' due to the operations of cross channel ferries to and from the port of Larne.

The Borough covers an area of approximately 131km², stretching over 36 miles along the Antrim coastline from Islandmagee and Ballycarry in the south to Glenarm and Carnlough in the north. Two of the Glens of Antrim and part of the Antrim Plateau make Larne Borough very scenic with two thirds designated as areas of outstanding natural beauty. (See Figure 1)

The population of the council area is just over 30,000 of which Larne town alone makes up approximately $\frac{2}{3}$ of the total population. Larne is a busy seaport and market town situated 20 miles north of Belfast. It is within east reach of Northern Ireland's two main airports being 21 miles from Belfast International Airport and 24 miles from Belfast City Airport. The area is supported both by major roads and a continuous rail link to Belfast – Dublin route.

The manufacturing, tourism and agriculture industries provide the main economic base of the Borough



4.0 Review and Assessment for Carbon Monoxide

Carbon monoxide (CO) is a pollutant gas generated by combustion sources. The dominant source is road transport, although domestic and other combustion processes contribute. At very high concentrations (such as may occur inside a building with a faulty heating appliance), it can be a dangerous asphyxiant. Whilst outdoor concentrations do not generally reach dangerous levels, they may still have adverse health effects for vulnerable people. As CO is a component of vehicle emissions, the highest outdoor concentrations occur near busy roads.

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

4.1 Conclusion from the first round of review and assessment

The first round of review and assessment concluded that there were no significant sources of carbon monoxide in the Larne area or in neighbouring areas and that there were no proposals for developments likely to emit this pollutant. The objective for carbon monoxide was likely to be achieved at all locations in the Larne area and there was no need to undertake a second stage review and assessment.

4.2 Update Screening Assessment

4.2.1 Monitoring data

Carbon monoxide is not monitored locally within Larne Borough Council area.

4.2.2 Very Busy Roads/Junctions

There are no very busy roads or junctions in Larne Borough. Very busy is defined as :

- Single carriageway road with daily average traffic flow exceeding 80,000 vehicles per day
- Dual carriageway (2 or 3 lane) roads with daily average traffic flows which exceed 120,000 vehicles per day

The busiest road in the Council area is the A8 which has annual average daily traffic flow of 17,400 vehicles per day (latest figure 2004).

4.3 Conclusion

The assessment has indicated that the objective for carbon monoxide is unlikely to be exceeded at any location in the Larne area.

4.4 Recommendation

There is no need to undertake a detailed assessment for carbon monoxide.

5.0 Review and Assessment for Benzene

Benzene is a known human carcinogen (cancer causing substance), and also contributes to the formation of ground-level ozone (summer smog). The main sources of benzene emissions in the UK are petrol vehicles, petrol refining, and the fuel distribution from petrol stations without vapour recovery systems. National benzene concentrations have declined in recent years, mainly due to the increasing use of three-way catalytic converters and the introduction of vapour recovery systems in petrol stations (Stage 1 and 2 control).

Since January 2000, EU legislation has reduced the maximum benzene content of petrol to 1%, from a previous upper limit of 5%. The European Auto-Oil programme will further reduce emissions for cars and light-duty vehicles, and emissions of benzene from the storage and distribution of petrol (LAQM.TG (03)).

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

5.1 Conclusion from the first round of review and assessment

The first round of review and assessment concluded that there were no significant sources of benzene in the borough or in neighbouring areas and there were no proposals for developments likely to emit the pollutant. Road transport represents the most significant source of benzene however national policies were expected to deliver the air quality objective end of 2003. The objective for benzene was likely to be achieved at all locations in the Larne area and there was no need to undertake a second stage review and assessment.

5.2 Update Screening and Assessment

5.2.1 Monitoring data

Benzene is not monitored locally within Larne Borough Council area.

5.2.2 Very Busy Roads/Junctions

There are no very busy roads or junctions in Larne Borough. Very busy is defined as :

- Single carriageway road with daily average traffic flow exceeding 80,000 vehicles per day
- Dual carriageway (2 or 3 lane) roads with daily average traffic flows which exceed 120,000 vehicles per day

The busiest road in the Council area is the A8 which has annual average daily traffic flow of 17,400 vehicles per day (latest figure 2004).

5.2.3 Industrial Sources

There are no petrochemical or other significant works that emit sufficient benzene within Larne Borough or in neighbouring authorities to consider for the purpose of this assessment.

5.2.4 Petrol Stations

There are four petrol stations within the Borough which have a throughput of greater than 1000m³, however none of these have a busy road nearby. A busy road is considered to be one with more than 30,000 vehicles per day. In addition there is no exposure within 10m of any of the pumps at the service stations in question. As no petrol station meets all of the above criteria there is no requirement to assess this source further.

A list of petrol filling stations is included in the list of prescribed processes in the district in Appendix 1.

5.2.5 Major fuel storage depots (petrol only)

There are no major fuel storage depots in Larne Borough Council area.

5.3 Conclusion

The assessment has indicated that the objective for benzene is unlikely to be exceeded at any location in the Larne area.

5.4 Recommendation

There is no need to undertake a detailed assessment for benzene.

6.0 Review and Assessment for 1, 3 Butadiene

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

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

6.1 Conclusion from the first round of review and assessment

The first round of review and assessment concluded that there were no significant sources of 1-3 butadiene in the Larne or neighbouring areas and there were no proposals for developments likely to emit this pollutant. Road transport represented the most significant source of 1-3 butadiene however national policies were expected to deliver the air quality objective by 2003. The objective for 1-3 butadiene was likely to be achieved at all locations within the Larne area and there was no need to undertake a second stage review and assessment of 1-3 butadiene.

6.2 Update Screening and assessment

6.2.1 Monitoring data

1,3-Butadiene is not monitored locally within Larne Borough Council area.

6.2.2 New Industrial Sources

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

6.2.3 Industrial Sources with Substantially Increased Emissions

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

6.3 Conclusion

The assessment has indicated that the objective for 1,3-butadiene is unlikely to be exceeded at any location in the Larne area.

6.4 Recommendation

There is no need to undertake a detailed assessment for 1,3-butadiene.

7.0 Review and Assessment for Lead

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

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

7.1 Conclusion from first round of review and assessment

The first round of review and assessment concluded that there were no significant sources of lead in the Larne or neighbouring areas and there were no developments likely to emit this pollutant.

The objective for lead was likely to be achieved at all locations within the Larne area and there was no need to undertake a second stage review and assessment for lead.

7.2 Update Screening and assessment

7.2.1 Monitoring data outside an Air Quality Management Area

Lead is not monitored locally within Larne Borough Council area.

7.2.2 New Industrial Sources

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

7.2.3 Industrial Sources with Substantially Increased Emissions

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

7.3 Conclusion

The assessment has indicated that the objective for lead is unlikely to be exceeded at any location in the Larne area.

7.4 Recommendation

There is no need to undertake a detailed assessment for lead.

8.0 Review and Assessment for Nitrogen Dioxide

Nitrogen dioxide is a respiratory irritant associated with both acute (short-term) and chronic (long-term) effects on human health, particularly in people with asthma. Nitrogen dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NO_x). All combustion processes produce NO_x emissions, largely in the form of nitric oxide, which is then converted to nitrogen dioxide, mainly as a result of reaction with ozone in the atmosphere. It is nitrogen dioxide that is associated with adverse effects upon human health.

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

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

8.1 Conclusion from first round of review and assessment

Larne Borough Council's first stage review and assessment of air quality concluded that it was necessary to proceed to a second review and assessment for nitrogen dioxide due to the following:

- One road junction exceeding annual average daily traffic threshold
- One single carriageway road and five junctions of single / dual carriageway roads exceeding 10,000 v.p.d. and sensitive properties within 2m
- A8 dual carriageway exceeds 10,000 v.p.d. and sensitive properties within 10m
- One significant Part A process in Carrickfergus Borough Council area.

As part of the second and third stage review and assessment of air quality Air Quality Consultants were commissioned to predict the levels of nitrogen dioxide at the locations identified as potentially exceeding the air quality objective and assess the impact of industry. Monitoring of nitrogen dioxide at eight locations was instigated.

The modelling of nitrogen dioxide emissions from road traffic, the assessment of industrial sources and the use of historical and more recent monitoring data indicated that it was unlikely that the 1-hour mean or the annual mean would be exceeded for NO₂. It was not, therefore, necessary to propose any air quality management areas for nitrogen dioxide in the borough of Larne.

8.2 Update Screening and assessment

8.2.1 Monitoring data outside an Air Quality Management Area

Monthly average concentrations of NO₂ are monitored using passive diffusion tubes located at 8 sites identified as having potentially the highest concentration of NO₂ at the first round of review and assessment. Monitoring commenced in May 2002 and all available results are summarised in Appendix 2.

Diffusion tubes are subject to variance and bias (over read or under read) based on the methods of preparation and analysis by individual laboratories. A number of studies are carried out each year on NO₂ tubes prepared and analysed by Lambeth Scientific Services to determine, bias adjustment. The most recent studies (five in total) were carried out in 2005 giving a bias factor of 1.13 compared to concentrations obtained from co-located automatic analysers. This factor of 1.13 has therefore been applied to the measured result to take account of the variance.

The annual average concentrations for 2005 from available data is shown in Table 1 below.

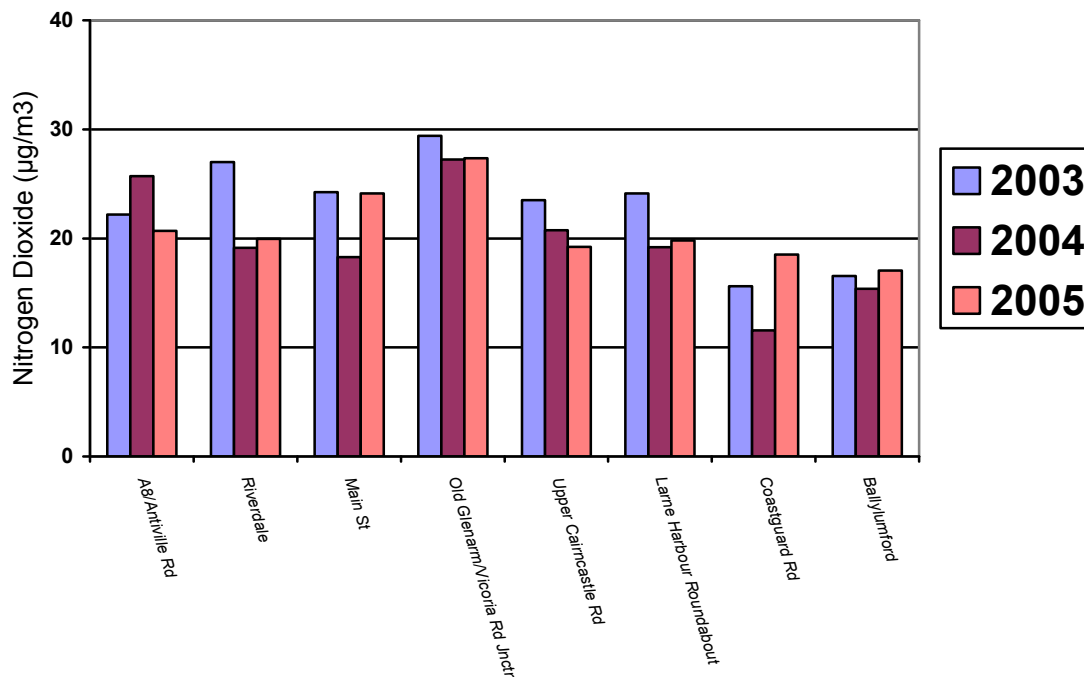
Table 1 Annual Average NO₂ Concentrations Measured 2005

Location	Data Capture %	Average Measured 2005 NO ₂ (ppb)	Annual Average 2005 NO ₂ concentration (ppb) Corrected for bias	Annual Average 2005 NO ₂ concentration (µg/m ³) Corrected for bias
Antiville Road/A8 junction	100	9.58	10.83	20.68
Riverdale	100	9.25	10.45	19.96
Main Street	91.7	11.18	12.63	24.12
Victoria Road / Agnew St junction	100	12.67	14.32	27.35
Upper Cairncastle Road	100	8.91	10.07	19.23
Larne Harbour Roundabout	91.7	9.18	10.37	19.81
Coastguard Road	100	8.58	9.69	18.51
Ballylumford Road, Islandmagee	91.7	7.90	8.93	17.06

The levels measured by the diffusion tubes in 2005 did not exceed the objective for nitrogen dioxide of 21 ppb (40µg/m³) and therefore the areas monitored have remained within the nitrogen dioxide objectives for 2005.

The figure below compares the annual average NO₂ concentrations obtained from the diffusion tubes during 2003, 2004 and 2005 at each monitoring site.

Figure 2 Comparison of Measured NO₂ Concentrations 2003-2005



The chart shows that there have been no significant increases in levels of NO₂ in 2005. Three years is too short a monitoring period to establish a meaningful trend. A trend would only be considered significant when supported with at least five years of monitoring data.

8.2.2 Monitoring data inside an Air Quality Management Area

There is no air quality management area for nitrogen dioxide within Larne Borough

8.2.3 Narrow congested streets with residential properties close to the kerb

No streets within Larne Borough meet all of the screening criteria given in guidance LAQM.TG (03). Main Street in Larne town does not have residential properties close to the kerb.

8.2.4 Junctions

Junctions were considered during the first round of review and assessment and findings indicated that it was unlikely that the 1-hour mean or the annual mean objective would be exceeded for NO₂.

8.2.5 Busy streets where people may spend 1 hour or more close to traffic

The major town in Larne Borough is Larne town and Main Street is the main shopping area. Main Street in Larne was considered in the first round of review and assessment as a precaution for the following reasons:

- sections of the street are canyon like
- potential exposure to the public as a shopping area
- lack of traffic data

Following DMRB modelling Main Street was predicted to have NO₂ levels substantially below the objective. This finding is supported by continuing NO₂ diffusion monitoring data. (See 8.2.1 above)

8.2.6 Roads with high flow of buses and/or heavy goods vehicles

Within Larne Borough the roads which would have the highest concentration of heavy goods vehicles are the Shaneshill Road and the A8 due to traffic to and from Larne Harbour. Roads Service Traffic data indicates that the % HGV for A8 traffic is 13.6% and 12.1 % along the Shaneshill Road. (Department for Regional Development Roads Service, Traffic and Travel Information 2004 incorporating Annual Traffic Census and Vehicle Kilometres of Travel).

As no roads within the borough have an unusually high proportion of heavy duty vehicles (i.e. greater than 25% of total flow), no further review is required under this section.

8.2.7 New Roads constructed or proposed since first round of review and assessment

No new roads have been constructed or proposed since the first round of review and assessment. Two new roundabouts have been constructed on the A8 dual carriageway to improve traffic flow however these measures are unlikely to have had any impact on traffic volume.

8.2.8 Roads close to the objective during the first round of Review and Assessment

In the first round of review and assessment DMRB modelling predicted that emissions arising from road transport at two locations, namely Larne Harbour Roundabout and Antiville Road/A8 Junction, were to cause exceedances of the annual average objective for NO₂. (NETCEN 2002 report). Subsequent monitoring using diffusion tubes at these locations however has shown that levels remain within the nitrogen dioxide objectives for 2005.

No other road or junctions were identified in the first round as being close to the objective and therefore no further review is necessary in this section.

8.2.9 Roads with significantly changed traffic flows

Within Larne Borough no roads with more than 10,000 vehicles per day have experienced an increase in traffic of more than 25% since the first round of review and assessment.

8.2.10 Bus Stations

Within Larne Borough there are no bus stations with a flow of buses of more than 1000 buses per day

8.2.11 New Industrial Sources

There are no new industrial sources of nitrogen dioxide in or close to the boundaries of Larne Borough.

8.2.12 Industrial Sources with Substantially Increased Emissions

None of the industrial sources identified in the first round of review and assessment have substantially increased nitrogen dioxide emissions, either within Larne Borough or close to the boundaries.

8.2.13 Aircraft

There are no airports or airfields in the Borough of Larne.

8.3 Conclusion

The assessment has indicated that both the annual mean and hourly objective for nitrogen dioxide are unlikely to be exceeded at any location in the Larne area.

8.4 Recommendation

There is no need to undertake a detailed assessment for nitrogen dioxide

9.0 Review and Assessment for Sulphur Dioxide

Sulphur dioxide is an acute respiratory irritant, hence the short averaging time for its objective. The main source of sulphur dioxide in the UK is power stations, which accounted for more than 71% of emissions in 2000. There are also significant emissions from other industrial combustion sources. Domestic sources now only account for 4% of emissions, but can be locally much more significant. Road transport currently accounts for less than 1% of emissions (LAQM.TG03).

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

9.1 Conclusion from first round of review and assessment

Larne Borough Council's first stage review and assessment of air quality concluded that it was necessary to proceed to a second review and assessment for sulphur dioxide due to the existence of one Part A process in the Borough of Larne and another in a neighbouring district, three areas of Larne town which potentially had significant amounts of domestic coal burning and shipping movements at Larne Harbour all with the potential to emit significant quantities of SO₂ and risked exceeding the 2005 objective.

As part of the second stage review and assessment NETCEN air quality consultants were commissioned to assess the impact of industry and concluded that emissions from the Part A processes in question were not likely to cause an exceedance of the air quality objective and therefore a third stage review and assessment was not necessary for these industrial sources. However, there was uncertainty over the effect that shipping would have on SO₂ concentrations and monitoring to further investigate this source of SO₂ in a third stage review and assessment was necessary.

Bubbler monitoring data was undertaken and indicated that air quality objectives would be met in areas of highest density domestic coal burning. However, diffusion tube monitoring data indicated higher SO₂ concentrations approaching the objectives elsewhere. A fuel use survey of privately owned houses was undertaken to obtain a more accurate percentage of coal burning among private properties and the screening method used at stage 1 was rerun and indicated that there was a risk that the SO₂ objective may not be met. A third stage review and assessment was therefore required.

At the third stage review and assessment monitoring of emissions of sulphur dioxide was carried out in the vicinity of Larne Harbour using real time analysers and determined that SO₂ objectives were not being exceeded in the initial 12 months of monitoring.

To enable domestic emissions of SO₂ to be modelled a fuel use survey of Housing Executive properties was carried out. The model predicted that the 15-minute mean SO₂ concentration objective would not be exceeded and no further assessment of domestic sources is required.

It was therefore not necessary to propose any air quality management areas for sulphur dioxide in the borough of Larne.

Continued monitoring of SO₂ as detailed in Larne Borough Council's Progress Report April 2005 indicated that sulphur dioxide levels still met the air quality objective in relevant locations.

9.2 Update Screening and Assessment

9.2.1 Monitoring data outside an Air Quality Management Area

(i) Smoke and SO₂ Bubblers

Monitoring of sulphur dioxide using smoke and SO₂ bubblers was ongoing in two areas of highest density domestic coal burning in Larne, namely Craigyhill and Townparks wards from July 2002 to December 2005. Data for 2005 only is considered in this report and is shown in table 2 below. Limited data is recorded for the Townparks site due to technical difficulties. Monitoring data previous to this date has been considered in previous review and assessment reports.

Table 2 SO₂ Maximum Daily Means (µg/m³)

Month And Year	(A) SO ₂ Measured Maximum Daily Mean (µg/m ³)		SO ₂ (Maximum Daily Mean (µg/m ³) (A X1.25 Correction Factor)	
	Craigyhill	Townparks	Craigyhill	Townparks
January 2005	24	21	30	26.25
February 2005	24	-	30	-
March 2005	24	-	30	-
April 2005	24	-	30	-
May 2005	24	-	30	-
June 2005	30	21	37.5	26.25
July 2005	24	-	30	-
August 2005	24	19	30	23.75
September 2005	30	26	37.5	32.50
October 2005	24	26	30	32.50
November 2005	30	33	37.5	41.25
December 2005	24	27	30	33.75

The highest daily mean concentration measured at the Craigyhill site was 37.5 µg/m³ and at the Townparks site the highest daily mean was 41.25 µg/m³ during the period of measurement.

No co-location studies have been carried out using SO₂ diffusion tubes adjacent to the bubblers so no further correction factor has been applied.

The 24-hour mean objective of 125 µg/m³ (47 ppb) was therefore not exceeded during the 12 months of measurement at either the Craigyhill or Townparks sites.

Comparison with the 15-minute and 1-hour objectives for each site is detailed in Table 3 below. The highest levels measured are worst-case scenarios at each monitoring location.

Table 3 Comparison of Maximum Daily Mean, 15-minute and 1-Hour Standards

Location	Maximum Daily Mean ($\mu\text{g}/\text{m}^3$)	> 80 $\mu\text{g}/\text{m}^3$	> 200 $\mu\text{g}/\text{m}^3$
Craigyhill	37.50	No	No
Townparks	41.25	No	No

As the maximum daily means did not exceed 80 $\mu\text{g}/\text{m}^3$ it is unlikely that the 15-minute mean objective will be exceeded in either area.

As the maximum daily means were less than 200 $\mu\text{g}/\text{m}^3$ it is unlikely that the 1-hour mean objective will be exceeded in either area.

The monitoring data from the 8-port smoke and SO_2 bubblers indicate that the air quality standard of sulphur dioxide will continue to be met in relation to residential coal burning.

(ii) SO_2 Diffusion Tubes

Monitoring using SO_2 diffusion tubes was discontinued in July 2004.

(iii) Monitoring of Sulphur Dioxide Using Real Time Automatic Analyser

Emissions from Larne Harbour are monitored in the vicinity of the port at a site selected on the basis that it was representative of levels at the nearest sensitive receptors which were domestic dwellings on Coastguard Road. The equipment was located at a distance of approximately 25m from said domestic properties and 235 m from the closest mooring quay. An automatic UV fluorescent SO_2 analyser was installed which could provide real time data on short-term objectives. The analyser is housed in an air-conditioned enclosure within the confines of Larne Harbour to provide enhanced security (See Figure 3). (Grid Ref 41320175). See Appendix 3 – Map 1 for location of air quality monitoring station.

The SO_2 analyser is calibrated manually every fortnight by trained Larne Borough Council staff. The calibration is performed with zero air from a zero air cylinder and span checks using a certified gas cylinder. NETCEN, a UKAS accredited laboratory, are appointed to provide QA/QC and data management services. Data is downloaded by NETCEN daily thus any faults or unusual results are detected early and brought to attention of Larne Borough Council. NETCEN carry out 6 monthly site audits and issue a UKAS certificate of calibration. Full ratification of data is provided which is comparable to that produced within the national network.

The equipment is US EPA approved and also approved in the DEFRA Automatic Urban Network. In addition, Envirotechnology Services plc, the supplier of the equipment, service and calibrate the equipment annually and provide emergency call out visits in the event of technical faults.

Figure 3 - Air Quality Monitoring Station Larne Harbour



Previous review and assessment had established that the concentrations measured in the vicinity of Larne Harbour did not exceed either the 1-hour mean or 24-hour mean standard for SO₂ over a 2 year period. Although 2 years is a short period to establish meaningful trends, based on the results obtained and the advice of the Review and Assessment helpdesk, Air Quality Consultants Ltd & University of West England, a decision was taken to relocate the monitoring station in order to explore the likelihood of exceedences due to domestic emissions elsewhere. The air quality monitoring station therefore ceased operation at the Larne Harbour site in December 2005. Monitoring data for the period 01 April 2005 to 02 December 2005 only is considered in this report. Monitoring data previous to this date has been considered in previous review and assessment reports.

Results

Monitoring results from 1 April 2005 to 02 December 2005 are summarised in tables 4 and 5 below.

**Table 4 Sulphur Dioxide Concentrations at Larne Harbour
01 April 2005 – 02 December 2005**

Number Very High	0
Number High	0
Number Moderate	6
Number Low	22788
Maximum 15-Minute Mean	386 µg/m ³
Maximum Hourly Mean	223 µg/m ³
Maximum running 8-Hour Mean	98 µg/m ³
Maximum running 24-Hour Mean	66 µg/m ³
Maximum Daily Mean	50 µg/m ³
Average	3 µg/m ³
Data Capture	98.6%

**Table 5 Sulphur Dioxide Exceedances at Larne Harbour
01 April 2005 – 02 December 2005**

Pollutant	Air Quality Regulations (NI) 2003	Exceedances	Days
Sulphur Dioxide	15-minute mean > 266 µg/m ³	5	4
Sulphur Dioxide	Hourly mean > 350 µg/m ³	0	0
Sulphur Dioxide	Daily mean > 125 µg/m ³	0	0

Table 4 shows details on the concentration of SO₂ measured at Larne Harbour including information on the health based bandings into which the levels can be categorised. The Air Pollution Information Service uses these Air Pollution Bands and Indexes to provide more detail on air pollution levels in a simple way similar to the sun or pollen index. When air pollution is rated LOW, effects are unlikely to be noticed even by those who are sensitive to air pollution. When MODERATE, sensitive people may notice mild effects but these are unlikely to need action. When HIGH, sensitive people may notice significant effects and action may need to be taken and when VERY HIGH, effects on sensitive people may worsen. The Air Pollution Information Service provides such information via a freephone service, teletext and on website www.airquality.co.uk/archive/standards.

As shown in Table 4 during the period of measurement there was six excursions into the MODERATE band with the remainder of the year in the LOW band.

Table 5 shows the concentrations measured did not exceed either the 1-hour mean or 24-hour mean standard for SO₂.

Five 15-minute mean measurements were above 266 µg/m³. The 15-minute mean standard for SO₂ is 266 µg/m³ not to be exceeded more than 35 times in a year. Although the monitoring period was for a nine month period only based on previous results it is considered unlikely that a further three months of monitoring would have resulted in more than 30 exceedances. Therefore the 15-minute mean objective is considered to have been achieved.

9.2.2 Monitoring data inside an Air Quality Management Area

There is no air quality management area for sulphur dioxide within Larne Borough.

9.2.3 New Industrial Sources

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

9.2.4 Industrial Sources with Substantially Increased Emissions

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

9.2.5 Areas of Domestic Coal Burning

As outlined earlier modelling work carried out during the first round of review and assessment determined that no further assessment of domestic sources was required and it was not necessary to declare an air quality management area for domestic sources. To make best use of Council resources the air quality monitoring station was relocated in January 2006 in order to verify the model for domestic emissions and determine the actual likelihood of exceeding the SO₂ objectives in the areas of highest density domestic coal burning in Larne. Subsequent monitoring data will be reviewed in future review and assessment reports.

The Craigyhill, Antiville and Townparks areas of Larne town were assessed as a result of the first round of review and assessment due to the density of houses burning coal and will not be considered further in this report.

A review of the first round has however shown the need to focus on the density of houses burning coal over a smaller area of 500m x 500m. This is reflected in updated Technical Guidance LAQM.TG(03) which states that significant coal burning would be considered to be more than 100 houses burning solid fuel as the primary source of heating in an area of this size.

Professional judgement was used to identify several areas in which significant coal burning may be an issue. The areas considered were: - Ballystrudder (Islandmagee), West Street (Ballycarry), Seacourt (Larne), Cannel Vista (Glenarm), Toberwine/Altmore Street (Glenarm), Beachlands (Carnlough) and Croft area (Carnlough). Using maps, and data supplied by the Northern Ireland Housing Executive on the types of heating sources within their housing stock, it was found that in all cases there were less than 100 houses in the 500 X 500m area likely to be burning solid fuel as their primary source of heating.

9.2.6 Small Boilers > 5 MW_(thermal)

Only one combustion system greater than 5MW exists within the Larne area, Premier Power Ltd., Ballylumford Power Station, Islandmagee and has been considered under industrial sources.

9.2.7 Shipping

Shipping movements were assessed in the first round and it was determined that SO₂ objectives were not exceeded. See section 9.2.1. No further assessment is therefore required.

9.2.8 Railway Locomotives

There is one railway station in Larne. Details of the number of stationary idling engines at Larne Railway Station is shown in table 6 below.. Larne station is located on the Larne to Belfast railway line and therefore train journeys start and terminate at Larne station. Examination of the railway timetable show that trains would only remain at the station for more than 15 minutes on three occasions on a weekday. On these occasions the trains are typically stationary for no more than 5 minutes.

Table 6 Larne Railway Station

	Monday – Friday	Saturday	Sunday
No of trains per day	20	17	6
Time stationary with engine running	5 mins max	5 mins max	5 mins max

NB All trains have diesel engines

9.3 Conclusion

The assessment has indicated that both the annual mean and hourly objective 15 minute mean for sulphur dioxide are unlikely to be exceeded at any location in the Larne area.

9.4 Recommendation

There is no need to undertake a detailed assessment for sulphur dioxide

10.0 Review and Assessment for Particulate Matter (PM₁₀)

Particulate matter is of major health concern, as it has been linked with both increased morbidity and premature mortality. A wide range of emission sources contribute to PM₁₀ concentrations in the UK. Research studies have confirmed that these sources can be divided into 3 main categories (APEG, 1999):

(i) *Primary particle* emissions are derived directly from combustion sources, including road traffic, power generation, industrial processes etc. (ii) *Secondary particles* are formed by chemical reactions in the atmosphere, and comprise principally of sulphates and nitrates. (iii) *Coarse particles* comprise of emissions from a wide range of sources, including resuspended dusts from road traffic, construction works, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles. The expected reduction in national particle emissions in future years is different for each source type. For example, emissions from road transport will be governed by legislation on vehicle emission standards; emissions of secondary particles will be largely governed by controls on power generation, industrial and transport SO₂ and NO_x emissions, both in the UK and in Europe; emissions of coarse particles are largely uncontrolled, and in general are not expected to decline in future years (LAQM.TG (03)).

Pollutant	Objective	To be achieved by
Particulate Matter (PM ₁₀)	50µg/m ³ when expressed as a 24 hour mean, not to be exceeded more than 35 times a year	31 December 2004
Particulate Matter (PM ₁₀)	40µg/m ³ when expressed as an annual mean	31 December 2004

10.1 Conclusion from first round of review and assessment

Larne Borough Council's first stage review and assessment of air quality concluded that it was necessary to proceed to a second review and assessment for particulate matter due to the existence of one Part A process in a neighbouring district, three areas of Larne town with significant amounts of domestic coal burning, shipping movements at Larne Harbour and 13 sections of single carriageway roads, road junctions and the A8 due to the proximity of sensitive properties and the amount of HGV traffic. All had the potential to emit significant quantities of particulate matter and risked exceeding the 2004 objective.

As part of the second stage review and assessment NETCEN air quality consultants were commissioned to assess the impact of industry, shipping movements and road traffic. NETCEN concluded that emissions from the Part A processes in question and road traffic were not likely to cause an exceedance of the air quality objective and therefore a third stage review and assessment was not necessary for these sources. However, there was uncertainty over the effect that shipping would have on PM₁₀ concentrations and a third stage review and assessment was recommended to further investigate this source of PM₁₀. (NETCEN, 2002)

A fuel use survey of privately owned houses was undertaken to obtain a more accurate percentage of coal burning among private properties. Rerunning the screening method used at stage 1 with more accurate data concluded that the PM₁₀ objective would be met.

Black smoke data had been collected from June 2002 using Smoke and SO₂ bubblers monitoring and results indicated that the PM₁₀ objective would be met in areas of highest density domestic coal burning. Although no further assessment of this pollutant was required, modelling of sulphur dioxide for domestic coal burning was necessary as part of the stage 3 assessment. It was considered worthwhile modelling for PM₁₀ simultaneously at little extra cost.

At the third stage review and assessment monitoring of emissions of PM₁₀ was carried out in the vicinity of Larne Harbour using a real time analyser. Monitoring data determined that PM₁₀ objectives were not exceeded in the initial 12 months of monitoring.

To enable domestic emissions of PM₁₀ and SO₂ to be modelled a fuel use survey of Housing Executive properties was carried out. The model predicted that the daily mean SO₂ concentration in 2004 would not be exceeded and no further assessment of domestic sources was required.

It was therefore not necessary to propose any air quality management areas for particulate matter in the borough of Larne.

Continued monitoring of PM₁₀ as detailed in Larne Borough Council's Progress Report April 2005 indicated that sulphur dioxide levels still met the air quality objective in relevant locations.

10.2 Update Screening and assessment

10.2.1 Monitoring data outside an Air Quality Management Area

(i) Background Concentrations

Estimated annual mean background concentrations have been mapped by the National Environmental Technology Centre and the maximum levels in Larne Borough are shown below:

PM ₁₀ 2004	17.1 µg/m ³
PM ₁₀ 2005	13.8 µg/m ³
PM ₁₀ 2010	16.3 µg/m ³
PM ₁₀ Secondary 2004	3.35 µg/m ³

The annual mean levels are below the annual mean objective for PM₁₀.

(ii) Smoke and SO₂ Bubblers

Monitoring of black smoke data for domestic emissions using smoke and SO₂ bubblers was ongoing in two areas of highest density domestic coal burning in Larne, namely Craighyhill and Townparks wards from July 2002 to December 2005. Data for 2005 only is considered in this report and is shown in table 7 below. Limited data is recorded for the Townparks site due to technical difficulties. Monitoring data previous to this date has been considered in previous review and assessment reports.

Table 7 Black Smoke Monthly Averages 2005 (µg/m³)

Month	Craighyhill Site	Townparks Site
January	3	-
February	4	-
March	4	-
April	4	-
May	3	-
June	5	-

July	4	-
August	4	6
September	4	5
October	5	7
November	5	6
December	7	13
ANNUAL AVERAGE	4	7.4

The black smoke data for 2005 shows no significant increases since the last review and assessment. As LAQM.TG(03) states that due to the uncertainty in the relationship between black smoke data collected using smoke and SO₂ bubblers is not to be relied upon other than to identify local hotspots no further analysis of the above data is undertaken in this report.

(iii) Monitoring of Particulate Matter Using Real Time Automatic Analyser

To determine whether emissions from Larne Harbour exceed the air quality objectives for PM₁₀, in accordance with LAQM TG4(00), monitoring of the pollutant was carried out in the vicinity of the port. A site was selected on the basis that it was representative of levels at the nearest sensitive receptors which were domestic dwellings on Coastguard Road. The equipment was located at a distance of approximately 25m from said domestic properties and 235 m from the closest mooring quay. A Beta-attenuation sampler (BAM 1020) was installed which provides real time data on PM₁₀ concentrations. The analyser is housed in an air-conditioned enclosure alongside the SO₂ analyser within the confines of Larne Harbour to provide enhanced security. (Grid Ref 4132 0175). See figure 3 for photograph and Appendix 3 – Map 1 for location map of monitoring station.

The BAM 1020 is operated in accordance with the operational manual. Sample flow rates are checked fortnightly by trained Larne Borough Council staff. The equipment also carries out its own automatic calibration every hour and should the instrument fail to meet specification an error is logged in memory and data is flagged.

NETCEN, a UKAS accredited laboratory, are appointed to provide QA/QC and data management services. Data is downloaded by NETCEN daily thus any faults or unusual results are detected early and brought to attention of Larne Borough Council. NETCEN carry out 6 monthly site audits and issue a UKAS certificate of calibration. Full ratification of data is provided which is comparable to that produced within the national network.

The equipment is US EPA approved and also approved in the DEFRA Automatic Urban Network. In addition, Envirotechnology Services plc, the supplier of the equipment, service and calibrate the equipment annually and provide emergency call out visits in the event of technical faults.

Previous review and assessment had established that the concentrations measured in the vicinity of Larne Harbour did not exceed either the daily or mean objective for PM₁₀ over a 2 year period. Although 2 years is a short period to establish meaningful trends, based on the results obtained and the advice of the Review and Assessment helpdesk, Air Quality Consultants Ltd & University of West England, a decision was taken to relocate the monitoring station in order to explore the likelihood of exceedences due to domestic emissions elsewhere.

The air quality monitoring station therefore ceased operation at the Larne Harbour site in December 2005.

Monitoring data for the period 01 April 2005 to 02 December 2005 only is considered in this report. Monitoring data previous to this date has been considered in previous review and assessment reports.

Results

Monitoring results from 1 April 2005 to 02 December 2005 are summarised in tables 8 and 9 below.

**Table 8 PM₁₀ Concentrations at Larne Harbour
01 April 2005 – 02 December 2005**

Number Very High	0
Number High	0
Number Moderate	70
Number Low	5044
Maximum Hourly Mean	256 µg/m ³
Maximum running 8-Hour Mean	119 µg/m ³
Maximum running 24-Hour Mean	94 µg/m ³
Maximum Daily Mean	75 µg/m ³
Average	22 µg/m ³
Data Capture	86.6%

**Table 9 Exceedances of PM₁₀ Objective at Larne Harbour
01 April 2004 – 31 March 2005**

Pollutant	Air Quality Regulations (NI) 2003	Exceedances	Days
PM ₁₀ Particulate Matter	Daily mean > 50 µg/m ³	9	9
PM ₁₀ Particulate Matter	Annual mean > 40 µg/m ³	0	0

Table 8 shows details the concentration of PM₁₀ measured at Larne Harbour including information on the health based bandings into which the levels can be categorised. The Air Pollution Information Service uses these Air Pollution Bands and Indexes to provide more detail on air pollution levels in a simple way similar to the sun or pollen index. When air pollution is rated LOW effects are unlikely to be noticed even by those who are sensitive to air pollution. When MODERATE sensitive people may notice mild effects but these are unlikely to need action. When HIGH, sensitive people may notice significant effects and action may need to be taken and when VERY HIGH, effects on sensitive people may worsen. The Air Pollution Information Service provides such information via a freephone service, teletext and on website www.airquality.co.uk/archive/standards.

Table 8 shows the number of excursions into the MODERATE, HIGH and VERY HIGH health based bandings. During the period of measurement there were no excursions into the HIGH or VERY HIGH bands.

The concentrations measured did not exceed the annual mean of 40 µg/m³. Nine daily mean measurements were above 50 µg/m³. The daily mean standard for PM₁₀ is 50 µg/m³ not to be exceeded more than 35 times in a year. Therefore the daily mean objective was not exceeded.

10.2.2 Monitoring data inside an Air Quality Management Area

There is no air quality management area for particulate matter within Larne Borough.

10.2.3 Junctions

Junctions were considered during the first round of review and assessment and DMRB modelling predicted that concentrations of PM₁₀ would be well below annual mean objective. There has been no significant increase in traffic since the first round which would merit further assessment of junctions.

10.2.4 Roads with a high flow of buses and/or HGVs

Within Larne Borough the roads which would have the highest concentration of heavy goods vehicles are the Shaneshill Road and the A8 due to traffic to and from Larne Harbour. Roads Service Traffic data indicates that the % HGV for A8 traffic is 13.6% and 12.1 % along the Shaneshill Road. (Department for Regional Development Roads Service, Traffic and Travel Information 2004 incorporating Annual Traffic Census and Vehicle Kilometres of Travel).

As no roads in Larne Borough have traffic flow of buses and/or heavy goods vehicles greater than 20% of the total flow. No further review is therefore required.

10.2.5 New roads constructed or proposed since the first round of Review & Assessment

No new roads have been constructed or proposed since the first round of review and assessment. Two new roundabouts have been constructed on the A8 dual carriageway to improve traffic flow however these measures are unlikely to have had any impact on traffic volume.

10.2.6 Roads close to the objective during the first round of Review & Assessment

No road or junctions were identified in the first round as being close to the objective and therefore no further review is necessary in this section.

10.2.7 Roads with significantly changed traffic flows

Within Larne Borough no roads with more than 10,000 vehicles per day have experienced an increase in traffic of more than 25% since the first round of review and assessment.

10.2.8 New Industrial Sources

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

10.2.9 Industrial Sources with Substantially Increased Emissions

None of the industrial sources identified in the first round of review and assessment have substantially increased nitrogen dioxide emissions, either within Larne Borough or close to the boundaries.

10.2.10 Areas of Domestic Coal Burning

As outlined earlier modelling work carried out during the first round of review and assessment determined that no further assessment of domestic sources was required and it was not necessary to declare an air quality management area for domestic sources. To make best use of Council resources the air quality monitoring station was relocated in January 2006 in order to verify the model for domestic emissions and determine the actual likelihood of exceeding the SO₂

objectives in the areas of highest density domestic coal burning in Larne. Subsequent monitoring data will be reviewed in future review and assessment reports.

The Craighyhill, Antiville and Townparks areas of Larne town were assessed as a result of the first round of review and assessment due to the density of houses burning coal and will not be considered further in this report.

A review of first round results has however shown the need to focus on the density of houses burning coal over a smaller area of 500m x 500m and is reflected in updated Technical Guidance LAQM.TG(03).significant coal burning would be considered to be more than 50 houses burning solid fuel as the primary source of heating in an area of this size.

Professional judgement was used to identify several areas in which significant coal burning may be an issue. The areas considered were: - Ballystrudder (Islandmagee), West Street (Ballycarry), Seacourt (Larne), Cannel Vista (Glenarm), Toberwine/Altmore Street (Glenarm), Beachlands (Carnlough) and Croft area (Carnlough).

Maps, data supplied by the Northern Ireland Housing Executive on the types of heating sources within their housing stock and the relevant nomogram within LAQM. TG(03) were used to determine the risk of exceeding the 24 hour mean PM₁₀ objective in 2004. None of the above areas are likely to be a significant area of domestic solid fuel burning.

10.2.11 Quarries/landfill sites/opencast coal/handling of dusty cargoes at ports etc.

Table 10 below list active sites in Larne Borough with the potential for fugitive emissions of PM₁₀

Fugitive Source	Houses within 200m	Number of Dust Complaints
Loughside Quarries	Yes	None
OMYA UK Ltd	Yes	None
Kilwaughter Limeworks	Yes	None

No complaints of dust nuisance have been reported to Council in respect of these sites. Observations at the sites indicate that there no significant dust emissions. Accordingly no further review is required under this section.

10.2.12 Aircraft

There are no airports or airfields in the Borough of Larne.

10.3 Conclusion

The assessment has indicated that both the daily and annual mean for particulate matter are unlikely to be exceeded at any location in the Larne area.

10.4 Recommendation

There is no need to undertake a detailed assessment for particulate matter

11.0 Summary of Conclusions

Pollutant	Detailed Assessment Required
Carbon Monoxide	No
Benzene	No
1,3 Butadiene	No
Lead	No
Nitrogen Dioxide	No
Sulphur Dioxide	No
Particulate Matter	No

11.1 Next Steps

Although the Updating and screening assessment has not identified any pollutants that require a detailed assessment work is ongoing in assessing the impact of domestic emissions for sulphur dioxide and particulate matter. As detailed in sections 9 and 10, the air quality monitoring station was relocated from Larne Harbour to a residential area of Larne town. The purpose of relocating the equipment is to verify modelling work carried out for SO₂ and PM₁₀ during the first round of review and assessment. The site for the monitoring station was chosen in order to be closest to the predicted areas of Larne town which would have the highest concentration of the pollutants. The monitoring station became operational in January 2005. Results for the first year monitoring will be reported in the next progress report to be completed in April 2007.

12.0 References

The Environment (Northern Ireland) Order 2002

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2000
Department of the Environment's Local Air Quality Management Technical
Guidance LAQM. TG(03).

Air Quality Regulations (Northern Ireland) 2003
Local Air Quality Management Policy Guidance LAQM.PGNI(03) (EHS)

Larne Borough Council First Stage Review and Assessment of Air Quality 2001

Air Quality Review and Assessment Stage 2 AEA/ENV/R/1010

Air Quality Review and Assessment Stage 3 – Domestic Fuel Combustion. Report produced for
Larne Borough Council Netcen/ED49246/Issue 1/AEAT/ENV/R/1642 January 2004

Traffic and Travel Information 2004 incorporating Annual Traffic Census and Vehicles Kilometres
of Travel, Department of Regional Development, Roads Service

Appendices

Appendix 1

Petrol filling stations in the Larne Borough

Carnlough Filling Station

Glenarm Road Filling Station

Harbour Motor & Eng. Ltd

Larne Service Station (Maxol)

Linn Road Filling Station

Glen Filling Station

Centra, Larne

Shell (NI) 44 Belfast Road

Viking Lodge Filling Station

Wilson's of Rathkenny

Appendix 2 NO₂ Diffusion Tube Monthly Results

Month and Year	Average Hourly NO ₂ Concentration (ppb)							
	Location							
	Antiville Rd/A8 (Grid Ref 3864 0212)	Riverdale (Grid Ref 3968 0249)	Main Street (Grid Ref 4016 0260)	Victoria Rd/Agnew Street (Grid Ref 4033 0285)	Upper Cairncastle Road (Grid Ref3920 0323)	Larne Harbour Roundabout (Grid Ref 4123 0196)	Coastguard Road (Grid Ref 4131 0171)	Ballylumford Road (Grid Ref 4206 0203)
May 2002	5	7	13	10	7	11	4	8
June 2002	20	7	11	19	11	9	12	13
July 2002	15	15	19	19	14	10	11	8
Aug 2002	2	5	5	12	4	3	2	4
Sept 2002	12	-	14	13	11	12	8	7
Oct 2002	15	21	14	20	16	20	9	12
Nov 2002	11	12	11	18	5	18	8	6
Dec 2002	19	9	17	19	17	21	12	10
Jan 2003	16	19	21	21	14	20	18	15
Feb 2003	16	20	-	15	18	18	15	10
Mar 2003	4	12	8	10	7	7	4	3
Apr 2003	6	8	10	12	8	4	2	2
May 2003	14	7	10	14	6	10	4	5
June2003	9	7	8	11	9	7	4	5
July 2003	3	-	4	4	7	7	3	54
Aug 2003	-	9	10	6	3	5	1	4
Sept 2003	-	13	13	13	11	5	5	4
Oct 2003	10	17	11	16	9	11	7	4
Nov 2003	-	19	6	-	19	16	8	15
Dec 2003	-	12	15	18	13	15	12	14
Feb 2004	7	4	7	5	5	13	6	8

Month and Year	Average Hourly NO ₂ Concentration (ppb)							
	Location							
	Antiville Rd/A8 (Grid Ref 3864 0212)	Riverdale (Grid Ref 3968 0249)	Main Street (Grid Ref 4016 0260)	Victoria Rd/Agnew Street (Grid Ref 4033 0285)	Upper Cairncastle Road (Grid Ref 3920 0323)	Larne Harbour Roundabout (Grid Ref 4123 0196)	Coastguard Road (Grid Ref 4131 0171)	Ballylumford Road (Grid Ref 4206 0203)
March 2004	12	11	10	9	13	12	3	7
April 2004	13	8	9	13	10	6	6	6
May 2004	-	5	11	9	6	2	5	5
June 2004	10	8	12	9	9	7	4	3
July 2004	11	-	6	11	9	11	5	3
Aug 2004	10	7	3	-	14	8	5	8
Sept 2004	10	6	11	18	8	8	4	9
Oct 2004	14	17	-	13	11	10	7	7
Nov 2004	14	11	-	19	9	10	6	11
Dec 2004	16	10	6	18	10	9	7	10
Jan 2005	9	8	9	12	9	10	8	-
Feb 2005	12	10	10	15	9	7	7	7
March 2005	10	8	12	8	6	3	4	5
April 2005	7	10	10	10	10	10	6	8
May 2005	9	13	14	12	9	13	11	10
June 2005	18	20	15	17	13	14	11	10
July 2005	9	7	9	12	7	6	7	11
Aug 2005	7	6	-	12	4	-	7	8
Sept 2005	11	7	7	16	6	10	4	7
Oct 2005	8	7	9	13	12	7	24	7
Nov 2005	2	6	9	10	10	8	6	5
Dec 2005	13	9	19	15	12	13	8	9

Appendix 4 Traffic Data

2004 Annual average daily traffic flow and percentage of heavy vehicles

Road No./Name	Location	24hour AADT	HGV %
A2	Larne – Ballygally at Black cave Tunnel	2380	3.6
A8	Larne – Ballynure at Drumahoe	17400	13.6
A36	Ballymena – Larne at Moorfield	5320	12.1
A8	Larne – Ballynure at Craiginorne	12260	13.5
B148	J with A2 – J with A8	1500	3.0
B120	Larne (J with B152 going N)	1560	2.8
C/UC	Ballygalley Castle Hotel	830	4.2
C/UC	Ballygalley (at Old Mill)	3330	2.6

Data provided by DRD, Roads Service of the DoE has provided all data.