

Air Quality Progress Report 2008



LARNE
Borough Council



European Union
Structural Funds

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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 formalised as a statutory duty in the Environment (Northern Ireland) Order 2002.

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

This was followed by the Second and Third Stage Review and Assessment, published in June 2004, which further scrutinised three pollutants which were potentially of concern, namely nitrogen dioxide, sulphur dioxide and particulates. The Second and Third Stage 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 any Air Quality Management Areas.

In May 2006 an Updating and Screening Report was produced which looked at any changes that may have occurred since the First Stage Reviews which may affected the seven prescribed pollutants and whether or not more detailed assessments were required. The report concluded that more detailed assessments were not required.

This Progress Report essentially brings air quality work up to date by determining whether air quality objectives continue to be met in Larne Borough and will identify if any further measures are required to improve air quality.

Since the last Update and Screening Report there have been no new local developments that would have a significant, detrimental effect on air quality. Assessment of recent monitoring data indicates that the air quality standards set by Government for nitrogen dioxide, sulphur dioxide and particulate matter continue to be met. Consequently, it will not be necessary for Larne Borough Council to declare any Air Quality Management Areas.

1.0 INTRODUCTION

The UK National Air Quality Strategy was published in 2000 and detailed the Government's plans to improve ambient air quality in the UK. The Environment (Northern Ireland) Order 2002 formalised the statutory duty for district councils in Northern Ireland to review and assess air quality within their district and designate air quality management areas where air quality objectives are likely to be exceeded.

Table 1 Air Quality Objectives for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be Achieved By
	Concentration ¹	Measured As	
Benzene	16.25 µg/m ³ (5ppb)	Running annual mean	31.12.2003
	3.25 µg/m ³	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m ³ (1ppb)	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m ³	Maximum daily running 8-hour mean	31.12.2003
Lead	0.5 µg/m ³	Annual mean	31.12.2004
	0.25 µg/m ³	Annual mean	31.12.2008
Nitrogen dioxide ¹	200 µg/m ³ (105ppb) Not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 µg/m ³ (21ppb)	Annual mean	31.12.2005
Particles (PM ₁₀) ²	50 µg/m ³ (gravimetric) not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40 µg/m ³ (gravimetric)	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m ³ (132ppb) not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 µg/m ³ (47ppb) not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 µg/m ³ (100ppb) not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

1. The objectives for nitrogen dioxide are provisional
2. PM₁₀ measured using the European gravimetric transfer sampler or equivalent.

The purpose of review and assessment is to ascertain the quality of air within the borough with respect to seven pollutants known to be the cause of certain health effects, which are summarised over page in Table 2.

Table 2 Pollutant Health Effects

Pollutant	Main Sources	Health Effects
Benzene	Combustion and distribution of petrol	Genotoxic human carcinogen (leukaemia)
1,3-Butadiene	Combustion of petrol	Genotoxic human carcinogen (lymphomas and leukaemia's)
Carbon Monoxide	Incomplete combustion of carbon containing fuels (mainly petrol engined vehicles)	Formation of carboxyhaemoglobin, reducing the capacity of the blood to carry oxygen
Lead	Industrial applications. Use of leaded petrol.	Toxic. Can cause problems in synthesis of haemoglobin, effects on kidneys, gastrointestinal tract, joints and reproductive systems. Acute or chronic damage to nervous system.
Nitrogen Dioxide	All combustion processes including road transport	Can cause inflammation of the airways at high concentrations. Enhances the response to allergens in sensitive individuals
Particulate Matter (PM ₁₀)	<u>Primary</u> particles from combustion sources (mainly road traffic & residential coal burning). <u>Secondary</u> particles formed by chemical reactions in the atmosphere (mainly sulphates and nitrates). <u>Coarse</u> particles, eg suspended soils/dusts/sea salt	Affects respiratory and cardiovascular systems. Particularly significant for those with pre-existing lung or heart disease
Sulphur Dioxide	Combustion of sulphur containing fossil fuels, principally coal and heavy oils	Causes constriction of the airway. Particularly affects those suffering from asthma or chronic lung disease

To date the review and assessment process took a three- stage approach, whereby each stage increased in detail and complexity. The first stage of the process was a desktop exercise which involved the compilation of data on emissions from transport, industrial and domestic sources and assessing the likelihood of air quality objectives being breached.

On completion of this stage, pollutants, which were unlikely to exceed the objectives, could be excluded from any further scrutiny. The remaining pollutants were then assessed at the second and third stages of the process using more sophisticated screening techniques including monitoring, air pollution dispersion modelling and predictions.

If, on completion of the third stage review and assessment it appeared that any air quality objectives were not likely to be achieved in a local authority's district then the area affected **must**, by order, have been designated as an Air Quality Management Area (AQMA).

Once an AQMA has been declared the local authority is required to carry out a further assessment of existing and likely future air quality and the respects in which it appears the objectives are not likely to be achieved. The local authority must then prepare a written action plan within 12 months with a view to achievement of the air quality objectives detailing related timescales.

The first stage review and assessment report for Larne Borough Council, completed in July 2001, concluded that the air quality objectives for benzene, 1,3-butadiene, carbon monoxide and lead were likely to be achieved at all locations in Larne by the

end of 2005, however the pollutants nitrogen dioxide, sulphur dioxide and particulate matter required further scrutiny at the second and third stage.

The second and third stage review and assessment report completed in June 2004, concluded that no exceedance of nitrogen dioxide, sulphur dioxide or particulate matter objectives were likely. Therefore there was no need for any Air Quality Management Areas (AQMA) to be declared anywhere in Larne Borough.

The next round of air quality review and assessments was carried out in two steps instead of the previous three-staged approach:

- An Updating and Screening Assessment for identifying those aspects that have changed since the last review and assessment which might lead to a risk of an air quality objective being exceeded
- A Detailed Assessment to provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposure.

The Updating and Screening Assessment report for Larne Borough Council was completed in May 2006. The report concluded that there was unlikely to be any exceedances of the seven pollutants and detailed assessments were not required. However it was noted that due to the relocation of air quality monitoring equipment that this situation may change.

Air Quality Progress reports are required in years when District Council is not carrying out an Updating and Screening Assessment or a Detailed Assessment. The timetable for future air quality is shown below:

Table 3 Timetable for Progress Reports within Review and Assessment System

<i>LAQM Activity</i>	<i>Completion Date</i>	<i>Which Authorities?</i>
Progress Report	April 2005	All District Councils
Updating and Screening Assessment	April 2006	All District Councils
Detailed Assessment	April 2007	Those District Councils which have identified the need for one in their April 2006 updating and screening assessment.
Progress Report	April 2007	Those District Councils which identified that there was no need for a detailed assessment in their April 2006 updating and screening assessment.
Progress Report	April 2008	All District Councils
Updating and Screening Assessment	April 2009	All District Councils
Detailed Assessment	April 2010	Those District Councils which have identified the need for one in their April 2009 updating and screening assessment.
Progress Report	April 2010	Those District Councils

		which identified that there was no need for a detailed assessment in their April 2009 updating and screening assessment.
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1.1 Purpose of the Progress Report

The purpose of a Progress Report is to ensure the continuity of the Local Air Quality Management (LAQM) process and to assist local authorities by:

- helping retain a profile for Local Air Quality Management within the council.
- providing a means for communicating air quality information to members and the public.
- maximising the usefulness and interpretation of the monitoring effort being carried out by the Council.
- maximising the value of the investment in monitoring equipment.
- making the next round of review and assessment easier, as there will be a readily available up to date source of information.
- helping Council respond to requests for up to date information on air quality.
- providing information to assist in other policy areas, such as transport and land use planning.
- providing a ready source of information on air quality for developers carrying out environmental assessments for new schemes.
- demonstrating progress with implementation of air quality Action Plans and/or air quality strategies.
- providing a timely indication of the need for further measures to improve air quality, rather than delaying until the next full round of review and assessment

This progress report covers the period from April 2005 to 31 December 2007. To be most meaningful this report should be read in conjunction with Larne Borough Councils First Stage Review and Assessment of Air Quality (July 2001), Second and Third Stage Review and Assessment of Air Quality (June 2004) and the Update and Screening Assessment (May 2006)

2.0 NEW MONITORING RESULTS

2.1 Air Quality Monitoring

The following pollutants are monitored within the Borough of Larne:

- (i) nitrogen dioxide
- (ii) sulphur dioxide
- (iii) particulate matter

2.2 Monitoring of Nitrogen Dioxide

The air quality objective for Nitrogen Dioxide (NO₂) to be achieved by 31 December 2005 is a 1 hour mean of 200µg/m³ not to be exceeded more than 18 times a year and an annual mean of not more than 40µg/m³.

Larne Borough Council monitors monthly average concentrations of NO₂ using passive diffusion tubes located at 8 relevant sites including adjacent to Ballylumford Power Station as well as at roadsides. See Appendix 3 – Map 1 for location of diffusion tubes.

A passive diffusion tube is a clear plastic tube open at one end with the closed end containing an absorbent for the gas, in this case NO₂, to be monitored. See Figure 1 over. Each tube is exposed for one month, resealed and then returned to the laboratory for analysis. Analysis was carried out by Lambeth Scientific Services, a UKAS accredited laboratory. Their trained staff operate rigorous quality control to UKAS standards ensuring the integrity of all results. The average ambient NO₂ concentration over the month is subsequently reported in µg/m³ and ppb.

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 bias adjustment factor for 2007 monitoring results from Lambeth diffusion tubes (50% TEA in Acetone) is 1.056, based on 10 studies which is the most studied since 2005. This factor was taken from the latest spreadsheet of factors i.e. version 04/08 (<http://www.uwe.ac.uk/aqm/review/>) A bias factor of 1.056 has therefore been applied to the measured result to take account of the variance.

In accordance with GB Government Guidance LAQM TG(03) where measured data has been collected the concentrations will need to be adjusted for the relevant year.

Lambeth Scientific Services have advised that exceedance of the 150ppb 1 hour mean standard is likely if the annual mean concentration exceeds 21 ppb (40ug/m³). This is applied only to the annual average concentration and not on month-by-month diffusion tube measurement. Defra guidance states that the 60 ug/m³ annual mean can be used as an adequate proxy for the hourly mean objective (200ug/m³). The annual average concentrations for 2005 to 2007 from available data are shown in Tables 4, 5 and 6 over page. All available monthly results are summarised in Appendix 1.

Figure 1 Nitrogen Dioxide Diffusion Tube



Results

Table 4 Annual Average NO₂ Concentrations Measured 2005

Location	Data Capture %	Average Measured 2005 NO₂ (ppb)	Annual Average 2005 NO₂ concentration (ppb) Corrected for bias	Annual Average 2005 NO₂ concentration (µg/m³) Corrected for bias
Antiville Road/A8 junction	100	9.6	11.68	22.31
Riverdale	100	9.25	11.26	21.51
Main Street	91.7	10.27	12.50	23.88
Victoria Road / Agnew St junction	100	12.7	15.46	29.52
Upper Cairncastle Road	100	8.9	10.83	20.69
Larne Harbour Roundabout	91.7	9.18	11.17	21.33
Coastguard Road	100	8.58	10.44	19.94
Ballylumford Road, Islandmagee	91.7	7.9	9.61	18.36

Table 5 Annual Average NO₂ Concentrations Measured 2006

Location	Data Capture %	Average Measured 2006 NO₂ (ppb)	Annual Average 2006 NO₂ concentration (ppb) Corrected for bias	Annual Average 2006 NO₂ concentration (µg/m³) Corrected for bias
Antville Road/A8 junction	100	10.67	12.99	24.81
Riverdale	83.3	8.5	10.34	19.75
Main Street	91.7	9.64	11.73	22.4
Victoria Road / Agnew St junction	100	13.75	16.73	31.95
Upper Cairncastle Road	100	8.33	10.14	19.3
Larne Harbour Roundabout	100	8.08	9.83	18.78
Coastguard Road	100	7.3	8.88	16.96
Ballylumford Road, Islandmagee	100	6.25	7.61	14.13

Table 6 Annual Average NO₂ Concentrations Measured 2007

Location	Data Capture %	Average Measured 2007 NO₂ (ppb)	Annual Average 2007 NO₂ concentration (ppb) Corrected for bias	Annual Average 2007 NO₂ concentration (µg/m³) Corrected for bias
Antville Road/A8 junction	83.3	12.7	13.41	25.65
Riverdale	91.6	8.64	9.12	17.45
Main Street	66.6	12.38	13.07	25.00
Victoria Road / Agnew St junction	66.6	11.63	12.28	23.49
Upper Cairncastle Road	91.6	7.9	8.34	15.95
Larne Harbour Roundabout	91.6	10.18	10.75	20.56

Coastguard Road	91.6	6.81	7.19	13.75
Ballylumford Road, Islandmagee	91.6	7.27	7.68	14.69

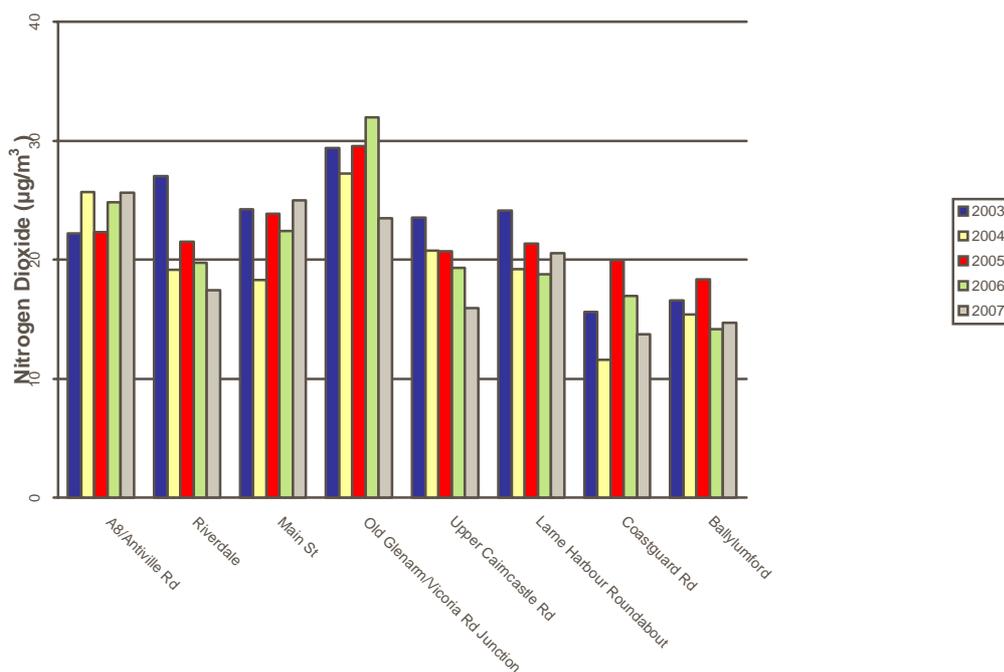
Conclusion

The levels measured by the diffusion tubes from 2005 to 2007 did not exceed the objective for nitrogen dioxide of 21 ppb (40µg/m³).

2.2.1 Comparison of Measured NO₂ Concentrations 2003-2006

Figure 2 compares the annual average NO₂ concentrations obtained from the diffusion tubes during 2003 to 2007 at each monitoring site.

Figure 2 Comparison of Measured NO₂ Concentrations 2003-2007



The chart shows that in 2007 the average concentrations of NO₂ have fallen since 2003, with the exception of the A8/Antiville Road and the Main Street, Larne. A number of new housing developments have been built since 2003 resulting in more traffic using the A8/Antiville Road junction, which may account for the increase. In relation to the Main Street there has only been a slight increase during 2007 since 2003 which at this stage would not be believed to be significant and it is important to note there was only 66.6% of the data captured at this site during 2007 which would affect the accuracy of the data.

2.3 Monitoring Of Sulphur Dioxide

The air quality objective for sulphur dioxide (SO₂) to be achieved by 31 December 2004 is a 1 hour mean of 350µg/m³ not to be exceeded more than 24 times per year and an 24 hour mean of 125 µg/m³ not to be exceeded more than 3 times per year. A 15-minute mean of 266 µg/m³ is not to be exceeded more than 35 times per year by 31 December 2005.

Larne Borough Council monitors levels of SO₂ in Larne using the following two methods:

- (i) 8 Port Smoke & SO₂ Bubblers at two locations (used until December 2005)
- (ii) Automatic Real Time SO₂ Analyser at one location

2.3.1 Monitoring Of Sulphur Dioxide Using 8 Port Bubblers

Smoke and SO₂ 8 Port Bubblers were installed in two areas of Larne with the highest densities of residential coal burning. The monitoring equipment was installed in the following locations:

1. Craigyhill – Lynn Community Centre, Linn Road, Larne (Grid Ref. 3873 0365)

Figure 3 Sampler Inlet



2. Townparks – McGarel Cemetery, Old Glenarm Road, Larne (Grid Ref. 4025 0335)

Figure 4 Sampler Inlet



Approval was given by AEA Technology Plc for both sites to be included in the UK Smoke and SO₂ monitoring network. The equipment was maintained weekly with the results of daily titration's and smoke forwarded to AEA Technology Plc on a monthly basis for input into the national database. Training of officers responsible for the equipment was conducted along with accompanied visits to ensure weekly maintenance. Validation checks together with auditing of chemical preparation and analysis were carried out as part of internal quality assurance procedures. Procedures with the 'UK Smoke and SO₂ Networks instruction manual' were followed as the QA/QC protocols.

See Appendix 3 – Map 1 for location of smoke & SO₂ Bubblers.

Data Capture

The bubblers determine concentrations of sulphur dioxide by use of net acidity measurements. Due to the general tendency for bubblers to under-read at high concentrations the maximum daily mean concentration is multiplied by 1.25. This factor is open to uncertainty and may overestimate concentrations but this is consistent with the precautionary approach used in Review and Assessments.

8-port bubbler apparatus has been used extensively throughout the UK in order to determine sulphur dioxide concentrations and whilst their use had declined in recent years, the data can still be of use in review and assessment.

The bubbler technique is used to measure daily mean sulphur dioxide concentration which can be directly compared to the 24-hour mean objective. For comparison with the 15-minute and 1-hour objectives, authorities may use correction factors based upon empirical relationships with the measured maximum daily mean. These relationships can be expressed by the following functions:

1. Calculation of 15-minute mean
99.9th percentile of 15-minute mean = 1.8962 x maximum daily mean
2. Calculation of 1-hour mean
99.7th percentile of 1-hour means = 1.3691 x maximum daily mean.

Following GB Government Guidance LAQM TG4 (00), to take account of uncertainty in the relationships, it may be assumed that the 15-minute mean objective is unlikely to be exceeded if the maximum daily mean concentration is less than 80 µg/m³, and the 1-hour mean objective is unlikely to be exceeded if the maximum daily concentration is less than 200 µg/m³.

Results

Results for 2005 are summarised in Table 7
Limited data is recorded for the Townparks site due to technical difficulties

Table 7 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 8 below. The highest levels measured are worst-case scenarios at each monitoring location.

Table 8 Comparison of Maximum Daily Mean, 15-minute and 1-Hour Standards

Location	Maximum Daily Mean (µg/m ³)	> 80 µg/m ³	> 200 µg/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.

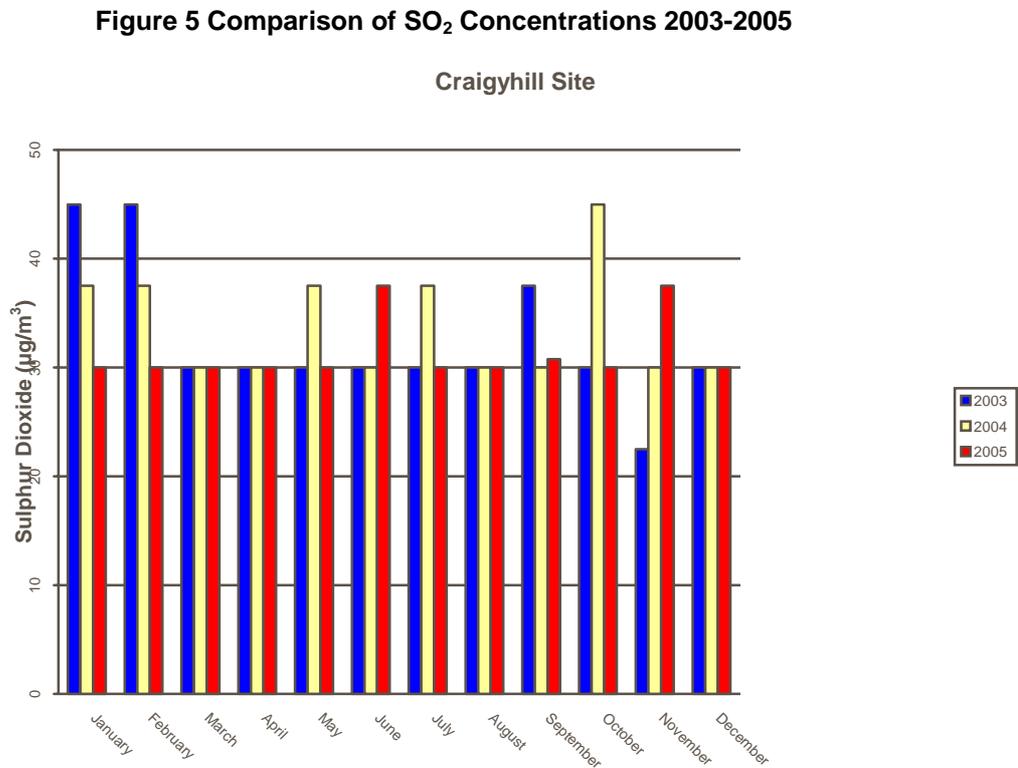
As the maximum daily means were less than 200 $\mu\text{g}/\text{m}^3$ it is unlikely that the 1-hour mean objective will be exceeded in either area.

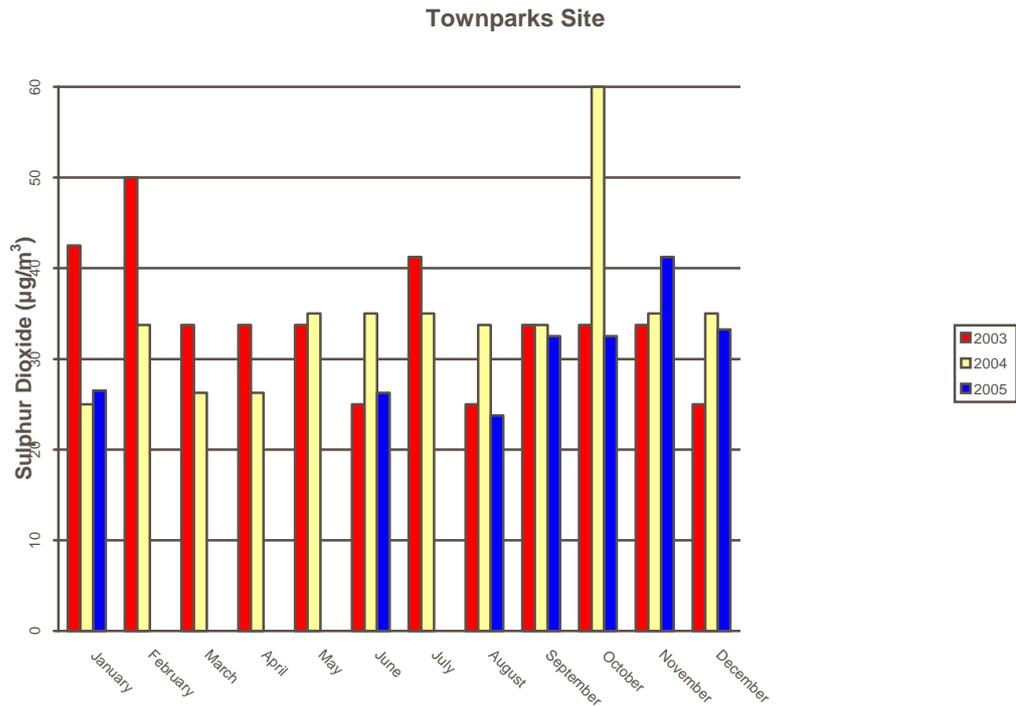
Conclusion

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

2.3.2 Comparison of SO_2 Concentrations 2003-2005

Figure 5 compares the maximum daily means (with correction factor) obtained from the bubbler equipment during 2003, 2004 and 2005 on a month-by-month basis at each monitoring site.





The maximum daily means of each month during 2003, 2004 and 2005 were well below the 24-hour mean objective of 125 µg/m³. No obvious trend in the measurements obtained from either site is evident over this short monitoring period. A trend would only be considered significant when supported with at least five years of monitoring data. Changes in concentrations from year to year are to be expected due to weather conditions.

2.3.3 Monitoring of Sulphur Dioxide Using Real Time Automatic Analyser

To determine whether emissions from Larne Harbour exceed the air quality objectives for SO₂, 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. An automatic UV fluorescent SO₂ analyser was installed which could provide real time data on short-term objectives. The analyser was housed in an air-conditioned enclosure within the confines of Larne Harbour to provide enhanced security. (Grid Ref 41320175). See Appendix 3 – Map 1 for location of air quality monitoring station.

Following advice from the Review and Assessment helpdesk, Air Quality Consultants Ltd & University of West England, in January 2006 the air quality monitoring Station was relocated to explore the likelihood of exceedance due to domestic emissions elsewhere in the Borough. The station was relocated to Churchill Road, Larne (Grid Ref D 388 032) (See appendix 3 – Map 1 for location) in order to determine the actual likelihood of exceeding the SO₂ objectives in the area of highest density domestic coal burning in Larne.

The SO₂ 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 6 - Air Quality Monitoring Station - Larne Harbour



Results

Monitoring results from 1 April 2005 to 2 December 2005; 26 January 2006 to 31 December 2006 and 1 January 2007 to 31 December 2007 are summarised in tables 9 - 14 below.

**Table 9 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 10 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 11 Sulphur Dioxide Concentrations at Churchill Road
26 January 2006 – 31 December 2006**

Number Very High	0
Number High	0
Number Moderate	0
Number Low	31398
Maximum 15-Minute Mean	93µg/m ³
Maximum Hourly Mean	61µg/m ³
Maximum running 8-Hour Mean	43µg/m ³
Maximum running 24-Hour Mean	26µg/m ³
Maximum Daily Mean	22µg/m ³
Average	2µg/m ³
Data Capture	98.3 %

**Table 12 Sulphur Dioxide Exceedances at Churchill Road
26 January 2006 – 31 December 2006**

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

**Table 13 Sulphur Dioxide Concentrations at Churchill Road
01 January 2007 - 31 December 2007**

Number Very High	0
Number High	0
Number Moderate	0
Number Low	34003
Maximum 15-Minute Mean	234µg/m ³
Maximum Hourly Mean	61µg/m ³
Maximum running 8-Hour Mean	17µg/m ³
Maximum running 24-Hour Mean	9µg/m ³
Maximum Daily Mean	8µg/m ³
Average	2µg/m ³
Data Capture	98.7 %

**Table 14 Sulphur Dioxide Exceedances at Churchill Road
01 January 2007 – 31 December 2007**

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

Tables 9 shows details on the concentration of SO₂ measured at Larne Harbour and Tables 11 and 13 show the concentrations of SO₂ measured at Churchill Road 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 free phone service, teletext and on website www.airquality.co.uk/archive/standards.

Conclusion

Larne Harbour

As shown in Table 9 during the period of measurement there were six excursions into the MODERATE band with the remainder of the year in the LOW band.

Table 10 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 $266\mu\text{g}/\text{m}^3$. The 15-minute mean standard for SO_2 is $266\mu\text{g}/\text{m}^3$ which is not to be exceeded more than 35 times a year. Although the monitoring period was for a nine month period only, based on previous results it was considered unlikely that a further three months of monitoring would have resulted in more than 30 exceedances. Therefore the 15-minute mean objective was considered to have been achieved.

Churchill Road

As shown in Table 11 and 13 during the period of measurement (January 2006 to December 2007) there were no excursions into the Moderate, High or Very High Bands.

Table 12 and 14 shows the concentrations measured did not exceed the 15-minute, the 1-hour or the daily mean standard for SO_2 during the period January 2006 to December 2007.

2.3.4 Comparison of SO_2 Concentrations

Larne Harbour

The table below compares the concentration of sulphur dioxide measured by the real time SO_2 automatic analyser.

Table 15

Pollutant	Air Quality Regulations (Northern Ireland) 2003	2003/2004 (April-March) Exceedances	2004/2005 (April-March) Exceedances	2005 (April-Dec) Exceedances
Sulphur Dioxide	15-minute mean > $266\mu\text{g m}^{-3}$	1	1	5
Sulphur Dioxide	Hourly mean > $350\mu\text{g m}^{-3}$	0	0	0
Sulphur Dioxide	Daily mean > $125\mu\text{g m}^{-3}$	0	0	0

The number of exceedances in a 12 month period remained the same for the first two years and increased in the third year. (NB The Air Quality Monitoring Station was relocated to Churchill Road in January 2006)

Churchill Road

Table 16

Pollutant	Air Quality Regulations (Northern Ireland) 2003	2006 (Jan-Dec) Exceedances	2007 (Jan-Dec) Exceedances
Sulphur Dioxide	15-minute mean > $266\mu\text{g m}^{-3}$	0	0
Sulphur Dioxide	Hourly mean > $350\mu\text{g m}^{-3}$	0	0
Sulphur Dioxide	Daily mean > $125\mu\text{g m}^{-3}$	0	0

No exceedances have been recorded in the past two years at this location. Future results will be considered in later progress reports as there is not enough monitoring data available at this stage to determine any significant trends.

2.4 Monitoring of Particulate Matter

The air quality objective for particulate matter (PM₁₀) to be achieved by the end of 2004 is an annual mean of no more than 40µg/m³ and a 24 hour mean of 50µg/m³ not to be exceeded on more than 35 days per year. The EU has also set indicative limit value for PM₁₀, which are to be achieved by 1 January 2010. These stage 2 limit values are a 24 hour mean of 50µg/m³ not to be exceeded more than 7 days per year and an annual of 20µg/m³ to be achieved by 2010. These new particle objectives are not currently included in Regulations for the purpose of Local Air Quality Management and there is no requirement for local authorities to achieve the 2010 standards. Reference to them at this stage may assist with longer term planning.

Larne Borough Councils monitors levels of PM₁₀ using the following methods:

- (i) 8 port smoke and SO₂ bubblers at two locations (Used until December 2005)
- (ii) Automatic Air Quality Analyser at one location

2.4.1 Monitoring of Particulate Matter using Smoke & SO₂ 8-Port Bubblers

An assessment of the impact of domestic solid fuel use can be carried out from existing black smoke data, based upon the empirical relationship described in Appendix 2.

Black smoke data was collected from June 2002 to December 2005 using Smoke and SO₂ 8-Port bubblers located in the Craigyhill and Townparks area. See Appendix 3 – Map 1 for location of bubblers. As detailed in section 2.3.1 the equipment was installed in the following secure locations:

1. Craigyhill – Lynn Community Centre, Linn Road, Larne
2. Townparks – McGarel Cemetery, Old Glenarm Road, Larne

Black smoke data was determined by measuring the staining to filters in conjunction with the 8-port bubbler apparatus. The equipment was maintained weekly with the results of filter reflectance forwarded to AEA Technology Plc on a monthly basis for input into the national database. Training of officers responsible for the equipment was conducted along with accompanied visits to ensure weekly maintenance. Validation checks together with auditing of chemical preparation and analysis were carried out as part of internal quality assurance procedures. Procedures with the 'UK Smoke and SO₂ Networks instruction manual' are followed as the QA/QC protocols.

Results

The black smoke monthly average and annual average for 2005 are shown in Table 17.

Limited data is recorded for the Townparks site due to technical difficulties.

Table 17 Black Smoke Monthly Averages 2005 (µg/m³)

Month	Craigyhill 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

Conclusion

The monitoring data from the 8 port smoke and SO₂ 8-Port bubblers indicated that the air quality standard for PM₁₀ will continue to be met in relation to residential coal burning.

2.4.2 Comparison of Smoke Data

The charts below and over page compare the monthly average black smoke data obtained from the 8 - port bubbler equipment during 2003, 2004 and 2005 at each monitoring site.

Figure 7

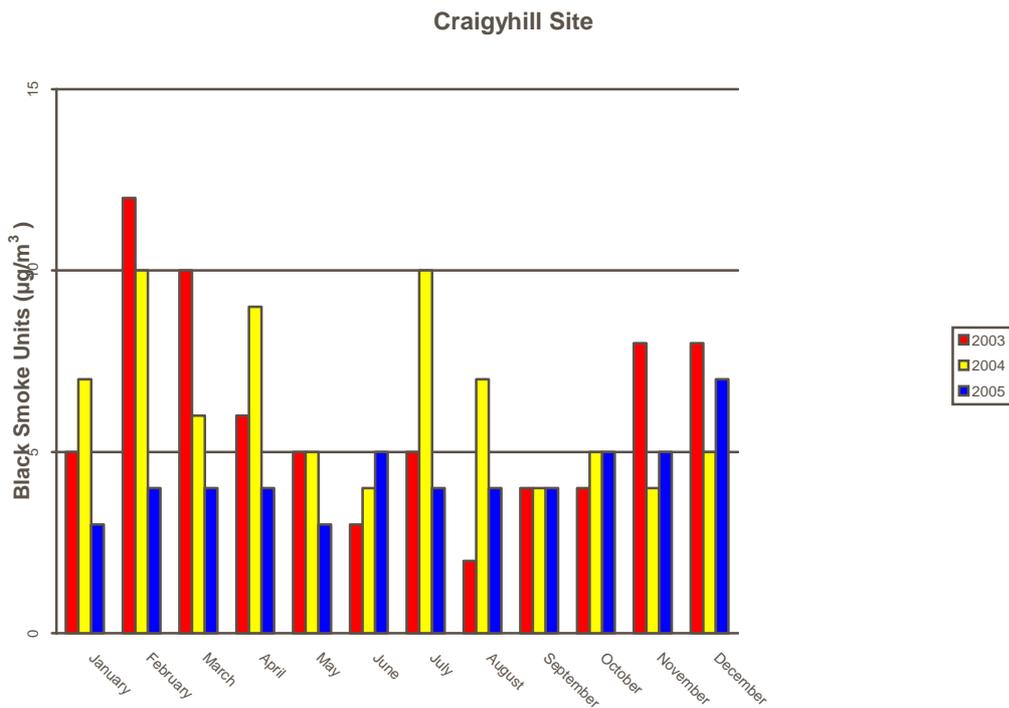
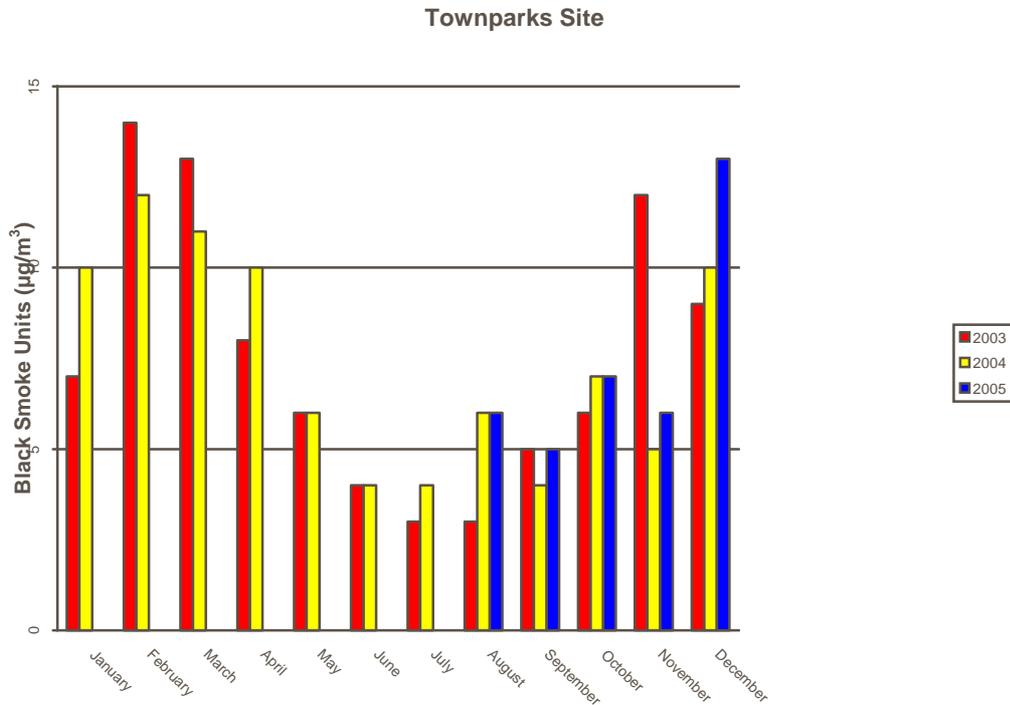


Figure 8



No obvious trend in the measurements obtained from either site is evident over this short monitoring period other than the characteristic higher concentrations in winter months associated with increased coal burning during cold weather. A trend would only be considered significant when supported with at least five years of monitoring data or longer. Changes in concentrations from year to year are to be expected due to weather conditions.

2.4.3 Monitoring of Particulate Matter Using Real Time Automatic Analyser

To determine whether emissions from Larne Harbour exceed the air quality objective 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 could provide 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 6 for photograph and Appendix 3 – Map 1 for location map of monitoring station.

As previously discussed in Section 2.3.3 in January 2006 the air quality monitoring Station was relocated to Churchill Road, Larne to explore the likelihood of exceedances due to domestic emissions elsewhere in the Borough.

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.

Results

Monitoring results from 1 April 2005 to 02 December 2005, 26 January 06 to 31 December 06 and January 2007 to December 2007 are summarised in Tables 18 - 23 below.

(Please note that the BAM PM10 data is included as indicative gravimetric equivalent and as such has had a 0.833 factor applied.)

**Table 18 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 19 Exceedances of PM₁₀ Objective at Larne Harbour
01 April 2005 – 02 December 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 20 PM₁₀ Concentrations at Churchill Road
26 January 06 – 31 December 06**

Number Very High	0
Number High	0
Number Moderate	110
Number Low	5976
Maximum Hourly Mean	820 µg/m ³

Maximum running 8-Hour Mean	199µg/m ³
Maximum running 24-Hour Mean	94 µg/m ³
Maximum Daily Mean	83 µg/m ³
Average	25 µg/m ³
Data Capture	74.4%

**Table 21 Exceedances of PM₁₀ Objective at Churchill Road
26 January 06 – 31 December 06**

Pollutant	Air Quality Regulations (NI) 2003	Exceedances	Days
PM ₁₀ Particulate Matter	Daily mean > 50 µg/m ³	14	14
PM ₁₀ Particulate Matter	Annual mean > 40 µg/m ³	0	0

**Table 22 PM₁₀ Concentrations at Churchill Road
01 January 07 – 31 December 07**

Number Very High	0
Number High	0
Number Moderate	74
Number Low	8017
Maximum Hourly Mean	238 µg/m ³
Maximum running 8-Hour Mean	187 µg/m ³
Maximum running 24-Hour Mean	94 µg/m ³
Maximum Daily Mean	82 µg/m ³
Average	19 µg/m ³
Data Capture	92.5%

**Table 23 Exceedances of PM₁₀ Objective at Churchill Road
01 January 07 – 31 December 07**

Pollutant	Air Quality Regulations (NI) 2003	Exceedances	Days
PM ₁₀ Particulate Matter	Daily mean > 50 µg/m ³	5	5
PM ₁₀ Particulate Matter	Annual mean > 40 µg/m ³	0	-

Tables 18, 20 and 22 show details on the concentration of PM₁₀ measured at Larne Harbour and Churchill Road, 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.

Conclusions

Larne Harbour

Table 18 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.

Table 19 shows the concentrations measured did not exceed the annual mean of $40\mu\text{g}/\text{m}^3$. Nine daily mean measurements were above $50\mu\text{g}/\text{m}^3$. The daily mean standard for PM_{10} is $50\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times in a year. Therefore the daily mean objective has not been exceeded.

Churchill Road

During the period January 2006 to December 2007 there were no excursions into the HIGH or VERY HIGH bands (Table 20 and 22).

The concentrations measured did not exceed the annual mean of $40\mu\text{g}/\text{m}^3$. During 2006 fourteen daily mean measurements were above $50\mu\text{g}/\text{m}^3$ for PM_{10} and during 2007 there were nine exceedances. The daily mean standard for PM_{10} is $50\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times in a year. Therefore the daily mean objective has not been exceeded during the 2 year monitoring period at this site (Table 21 and 23).

2.4.4 Comparison of PM_{10} Concentrations

Larne Harbour

Table 24 compares the concentration of particulate matter measured by the real time PM_{10} automatic analyser over three years. The periods of measurement are from April to March, except for 05/06 which the period of measurement ends in December.

Table 24

Pollutant	Air Quality Regulations (Northern Ireland) 2003	2003/2004 (April-March) Exceedances	2004/2005 (April-March) Exceedances	2005 (April-Dec) Exceedances
PM_{10} Particulate Matter (Gravimetric)	Daily mean $> 50 \mu\text{g m}^{-3}$	20	10	9
PM_{10} Particulate Matter (Gravimetric)	Annual mean $> 40 \mu\text{g m}^{-3}$	0	0	0

The number of exceedances over the monitoring period have fallen year on year. A trend would only be considered significant when supported with at least five years worth of monitoring data or longer.

Churchill Road

Table 25

Pollutant	Air Quality Regulations (Northern Ireland) 2003	2006 (Jan-Dec) Exceedances	2007 (Jan-Dec) Exceedances
PM_{10} Particulate Matter (Gravimetric)	Daily mean $> 50 \mu\text{g m}^{-3}$	14	5
PM_{10} Particulate Matter (Gravimetric)	Annual mean $> 40 \mu\text{g m}^{-3}$	0	0

The number of exceedances has fallen in the second year of monitoring at the Churchill Road site. It is too early to establish if there are any trends but future results will be considered in later progress reports.

3.0 NEW LOCAL DEVELOPMENTS

- 3.1 No new industrial processes i.e. Part A, B or C processes have commenced operation or changed significantly.
- 3.2 Shanes Hill Road Quarry has recommenced operation, however activity is believed to be minimal.
- 3.3 No new landfill sites.

4.0 ADDITIONAL INFORMATION

- 4.1 It has not been necessary for Larne Borough Council to declare any Air Quality Management Areas in the borough and therefore we cannot report progress on implementation of action plans.
- 4.2 The council does not intend to draw up a local air quality strategy at the present time, as designation of an Air Quality Management Area is not anticipated in the near future. This however is reviewed annually and will be reconsidered should pollutant levels begin to approach air quality objectives.
- 4.3 Proposed developments, which could have the potential to affect local air quality, include:
- (i) Extension to an existing quarry operated by OMYA at Munie Road, Glenarm
 - (ii) Extension to Kilwaughter Quarry by Kilwaughter Chemical Company, Starbog Road, Larne

Environmental Impact Assessments available for the two quarry extensions suggest that the implementation of planned mitigation measures will ensure the quarry developments will not have a significant detrimental effect on local air quality. The Environmental Health Department will be consulted by the Planning Service on the outstanding developments. Consultation is an opportunity for any concerns regarding the impact on air quality either direct or indirect, e.g. increased levels of traffic, to be addressed prior to planning permission being granted.

- (iii) Ongoing application for cement batching plant operation at Loughside Road Quarry. This will be subject to an IPPC permit with the Industrial Radiochemical Pollution Inspectorate.
- 4.4 Larne Borough Council does not monitor ozone, polycyclic aromatic hydrocarbons (PAHs). These pollutants are not currently covered by the regulations.
- 4.5 No complaints regarding odour and dust emission from regulated industrial sources have been received in recent years.

5.0 CONCLUSIONS AND DISCUSSION

Assessment of the available monitoring data for nitrogen dioxide, sulphur dioxide and particulate matter, indicates that air quality in Larne Borough currently meets the air quality objectives in relevant locations.

Air quality objectives are currently being met at Churchill Road however; further monitoring is required here to establish a meaningful trend.

The next Updating and Screening Assessment will be completed in April 2009.

6.0 REFERENCES

DETR (2000) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Department of the Environment, Transport and the Regions. Cm 4548, SE 2000/3, NIA

Review and Assessment: Pollutant Specific Guidance LAQM (TG4 (00) ISBN 1 85112 387 3 DETR May 2000

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

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Larne Borough Council Update and Screening Assessment Report 2006

7.0 APPENDICES

Appendix 1 – NO₂ Diffusion Tube Monitoring Results

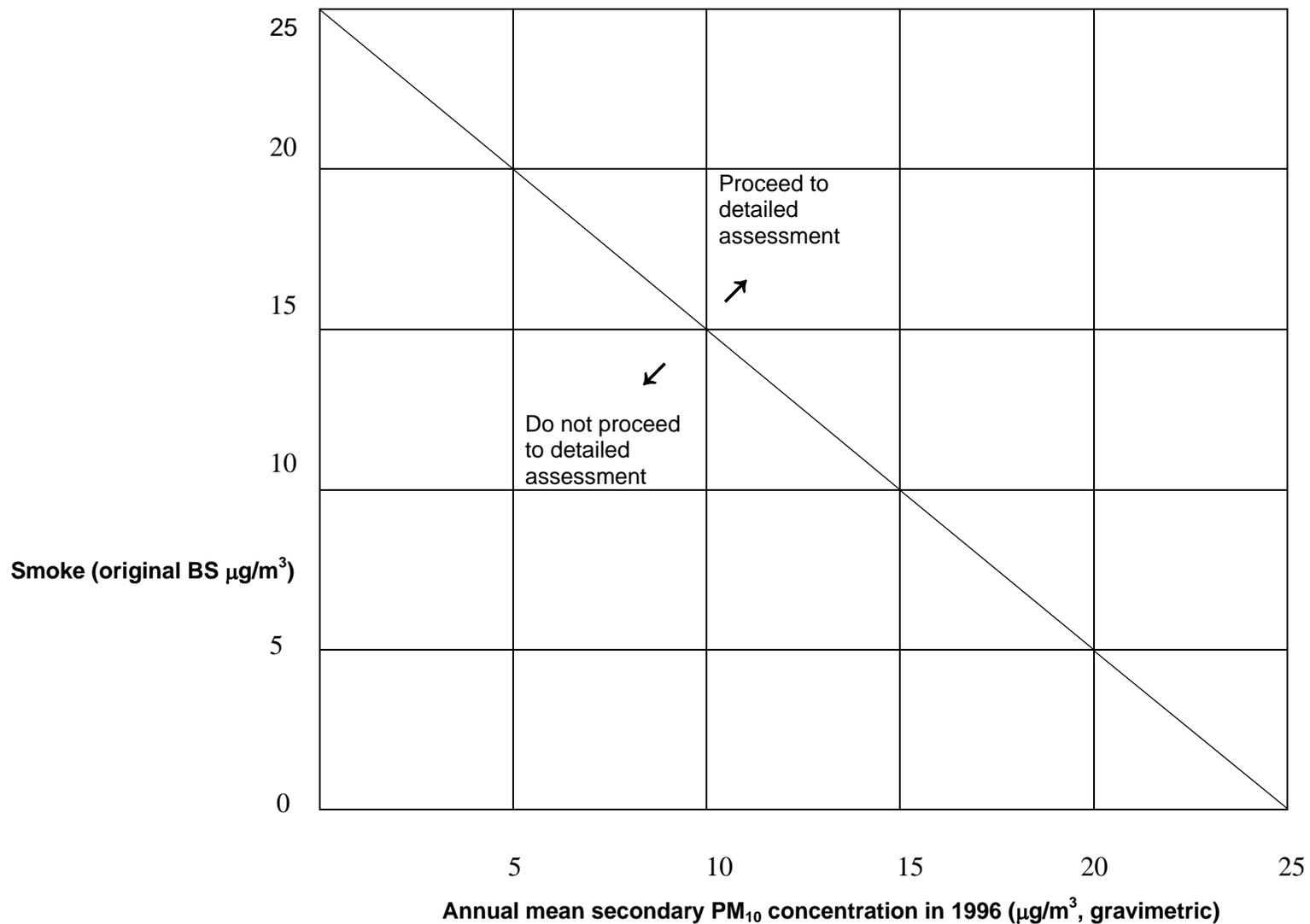
Table 26

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)
January 2005	9	8	9	12	9	10	8	-
February 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
August 2005	7	6	-	12	4	-	7	8
September 2005	11	7	7	16	6	10	4	7
October 2005	8	7	9	13	12	7	24	7
November 2005	2	6	9	10	10	8	6	5
December 2005	13	9	19	15	12	13	8	9
January 2006	15	14	14	32	12	8	6	9
February 2006	12	8	8	11	11	13	6	7
March 2006	6	6	4	8	5	6	9	3
April 2006	8	9	5	10	6	6	5	3
May 2006	11	7	11	13	8	9	8	7
June 2006	11	-	-	15	10	7	7	4
July 2006	10	-	10	13	10	8	7	4
August 2006	9	7	10	11	7	10	6	8

	Average Hourly NO ₂ Concentration (ppb)							
	Location							
Month and Year	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)
September 2006	12	7	12	14	12	10	5	7
October 2006	10	8	8	10	3	4	6	7
November 2006	9	8	14	15	3	8	18	9
December 2006	15	11	10	13	13	8	5	5
January 2007	11	7	12	12	8	11	4	10
February 2007	19	12	15	13	10	11	6	8
March 2007	-	-	-	-	-	-	-	-
April 2007	11	8	8	5	8	7	11	6
May 2007	-	6	10	7	7	7	5	5
June 2007	8	8	4	-	3	9	7	4
July 2007	7	7	-	13	5	9	6	6
August 2007	9	7	15	14	4	10	6	4
September 2007	13	7	-	13	7	10	7	7
October 2007	15	10	17	-	6	13	8	5
November 2007	14	10	-	16	11	11	7	12
December 2007	20	13	18	-	18	14	8	13

Appendix 2

Figure 9 Relationship between annual mean black smoke measurement and The annual mean secondary PM₁₀ concentration



Appendix 3 – Map 1

Appendix 1 – NO₂ Diffusion Tube Monitoring Results

Table 26

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)
January 2005	9	8	9	12	9	10	8	-
February 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
August 2005	7	6	-	12	4	-	7	8
September 2005	11	7	7	16	6	10	4	7
October 2005	8	7	9	13	12	7	24	7
November 2005	2	6	9	10	10	8	6	5
December 2005	13	9	19	15	12	13	8	9
January 2006	15	14	14	32	12	8	6	9
February 2006	12	8	8	11	11	13	6	7
March 2006	6	6	4	8	5	6	9	3
April 2006	8	9	5	10	6	6	5	3
May 2006	11	7	11	13	8	9	8	7
June 2006	11	-	-	15	10	7	7	4
July 2006	10	-	10	13	10	8	7	4
August 2006	9	7	10	11	7	10	6	8

	Average Hourly NO₂ Concentration (ppb)							
	Location							
Month and Year	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)
September 2006	12	7	12	14	12	10	5	7
October 2006	10	8	8	10	3	4	6	7
November 2006	9	8	14	15	3	8	18	9
December 2006	15	11	10	13	13	8	5	5
January 2007	11	7	12	12	8	11	4	10
February 2007	19	12	15	13	10	11	6	8
March 2007	-	-	-	-	-	-	-	-
April 2007	11	8	8	5	8	7	11	6
May 2007	-	6	10	7	7	7	5	5
June 2007	8	8	4	-	3	9	7	4
July 2007	7	7	-	13	5	9	6	6
August 2007	9	7	15	14	4	10	6	4
September 2007	13	7	-	13	7	10	7	7
October 2007	15	10	17	-	6	13	8	5
November 2007	14	10	-	16	11	11	7	12
December 2007	20	13	18	-	18	14	8	13