

Armagh City and District Council

Local Air Quality Progress Report

JUNE 2008

Executive Summary

Under the Local Air Quality Management (LAQM) regime, introduced by the Environment (NI) Order 2002, Armagh City and District Council has a duty to review and assess local air quality against health-based, statutorily prescribed pollutant limits and to undertake measures aimed at reducing pollutant levels where appropriate.

The Council's Stage 2/3 LAQM Review and Assessment report was recently appraised by the University of West England (UWE) on behalf of the Department of Environment's Environment and Heritage Service (EHS), and accepted with the condition that a supplementary document highlighting the impact of SO₂ emissions from domestic coal burning in Armagh and PM₁₀ emissions from road traffic should be submitted. The conclusions reached in the Stage 2/3 Review and Assessment and the subsequent supplementary document, were that no further detailed assessments were required at this time for any of the pollutants reviewed and that there was currently no requirement for any statutory Air Quality Management Areas (AQMAs) to be declared.

Armagh City and District Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for any of the prescribed pollutants under review.

However, a subsequent appraisal by the University of the West of England (UWE) completed on behalf of the Environment and Heritage Service, determined that there was a potential risk of the objective limits for NO₂ being breached at Mall West Terrace in Armagh City centre.

Following further consultation with UWE, the Council accepted that a further assessment of the emissions at Mall West would be required in order to determine a more accurate presentment of the NO₂ impact on air quality at that location. The subsequent detailed assessment concluded that a declaration of an AQMA was not required at that time. (*See Appendix C – Detailed Assessment 2007*)

Preparation of this Progress Report is the final activity prescribed in the timetable for the First Round of reviews and assessments as set out in LAQM Policy Guidance (LAQM.PGNI(03)). The report has been produced in accordance with guidance detailed in Progress Report Guidance LAQM.PRGNI(04), and summarises the findings of the LAQM activities undertaken by the Council including the currently available air quality monitoring results for 2003/2004.

The conclusion of this report confirms that for all the prescribed air pollutants, concentrations in the district are well within the statutory limits with the exception of 84 Railway Street and Mallview Terrace in Armagh City. Therefore, following consultation with the relevant authorities, Armagh City and District Council will be declaring (under

Article 12(1) The Environment (Northern Ireland) Order 2002) an Air Quality Management Area (AQMA) that incorporates both of these sites.

No PM10 data is available for Lonsdale Road for the monitoring year 2007. Armagh City and District Council discovered a problem with the PM10 monitor during consultations with AEANetcen when the data downloaded from the station was being ratified for the purposes of inclusion in this progress report. Further consultation with AEANetcen and EMS Ireland ascertained that there had been an on-going undetectable fault with the analogue board within the electronic circuits of the PM10 monitor. The data downloaded from the station was demonstrating an unusually high number of exceedences which was not commensurate with the level of exceedences experienced during the 2006 monitoring schedule. EMS has since rectified this problem as of March 2008. Unfortunately the data that has been recovered from the station for 2007 is not representative of the ambient PM10 emissions at Lonsdale Road and there has not been submitted as part of this report. The EHS (PEPG) in Belfast was made aware of this issue when the situation became critical and a report was issued to them outlining a log of events and time line regarding these developments. Historical data from the previous years of monitoring at Lonsdale Road demonstrates that there is unlikely to have been a breach of the number of exceedences for PM10 at this location. The Council is quite confident that this would be the situation for 2007 also and that no further assessment or declaration of an AQMA would have been necessary at this time. The Council is now looking into ways in which the process of identifying technical failures at the monitoring station can be dealt with in a swift manner so as to reduce the impact on the monitoring schedule.

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1.0 Introduction

1.1 Purpose and Role of Progress Reports

The local air quality management (LAQM) system was introduced in the Environment Act 1995 and subsequent regulations. Local authorities have to review the present quality of air and the likely future quality of air and assess whether the nationally prescribed objectives are likely to be achieved. Progress reports are required to be undertaken in the years when the authority is not carrying out Updating and Screening Assessments or a Detailed Assessment of air quality.

In 1995 the UK Government published its strategic framework for air quality management and established national strategies and policies on air quality. The Northern Ireland Environment Order came into force in January 2003 and implements the European Air Framework Directive 96/62EC and the UK Air Quality Strategy.

This progress report has been prepared as part of Armagh City & District Council's responsibilities under the Environment (Northern Ireland) Order 2002. The 'progress report' has been introduced into the local air quality system as a means of combating the 'stop-start' approach to environmental reporting and integrate the concepts of local air quality management into the routine of local authority operations.

It is intended that progress reports can assist the district councils in the following ways;

- By helping to retain a profile for LAQM within the council, including the retention of staff with knowledge of air quality issues.
- By providing a means for communicating air quality information to members and the public.
- By maximising the value of the investment in monitoring equipment.
- By making the next round of review and assessment that much easier, as there will be a readily available up-to-date source of information.
- By helping district councils respond to requests for up-to-date information on air quality.
- By providing information to assist in other policy areas, such as transport and land use planning.
- By providing a ready source of information on air quality for developers carrying out environmental assessments for new schemes.
- By demonstrating progress with implementation of air quality Action Plans and/or air quality strategies.
- By 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.

The overall aims of this progress report are to:

- Report progress on implementing local air quality management.
- Report progress in achieving and maintaining concentrations of prescribed pollutants below the air quality objectives.

This report has therefore been prepared in accordance with the Environment & Heritage Service guidelines as published in Progress Report Guidance LAQM.PRGNI(04), November 2004.

1.2 Air Quality Strategy Objectives

The following air quality objectives set out in the Air Quality Regulations provide the statutory basis for the system of Local Air Quality Management.

Table 1: Air Quality Strategy Objectives

Pollutant	Objective	Measured as	To be achieved by
Benzene Authorities in Scotland and Northern Ireland only	3.25 µg/m ³	Running Annual Mean	31/12/2010
1,3-Butadiene	2.25 µg/m ³	Running Annual Mean	31/12/2003
Carbon monoxide Authorities in England, Wales and Northern Ireland only	10.0 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	200 µg/m ³ Not to be exceeded more than 18 times per year	1 Hour Mean	31/12/2005
	40 µg/m ³	Annual Mean	31/12/2005
Particles (PM₁₀) (gravimetric)^d All authorities	50 µg/m ³ Not to be exceeded more than 35 times per year	24 Hour Mean	31/12/2004
	40 µg/m ³	Annual Mean	31/12/2004
Sulphur dioxide	266 µg/m ³ Not to be exceeded more than 35 times per year	15 Minute Mean	31/12/2005
	350 µg/m ³ Not to be exceeded more than 24 times per year	1 Hour Mean	31/12/2004
	125 µg/m ³ Not to be exceeded more than 3 times per year	24 Hour Mean	31/12/2004

1.3 Conclusions of Previous Review and Assessment

PM₁₀

Stage 1 of the first round of review and assessment completed in 2002, concluded that PM₁₀ emissions required a further Stage 2 assessment on the basis that it was not possible to rule out the risk of exceedences of prescribed standards at that time

Armagh City and District Council recently submitted a copy of the Stage 2/3 review and assessment report prepared by Netcen Limited. The report was accepted and approved by the Environment & Heritage Service following an appraisal by the University of West England (Bristol). However a further supplementary document was required on PM₁₀ emissions due to the fact that at that stage not enough QA/QC ratified data had been collected from the SO₂ real time analyser for domestic fuel emissions. This subsequent supplementary document was submitted to the Environment and Heritage Service in January 2005. The results of the supplementary document concluded that there was no exceedences and that a progression to a more detailed Stage 3 assessment was not necessary at this time.

Armagh City and District Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for PM₁₀.

SO₂

Stage 1 of the first round of review and assessment completed in 2002, concluded that SO₂ emissions required a further Stage 2 assessment on the basis that it was not possible to rule out the risk of exceedences of prescribed standards at that time. It was considered during the assessment of the property density combined with a fuel use survey in Armagh, that domestic solid fuel combustion may be a significant source of SO₂ emissions in the area. On this basis a further Stage 2 assessment was instigated.

Armagh City and District Council recently submitted a copy of the Stage 2/3 review and assessment report prepared by Netcen Limited. The report was accepted and approved by the Environment & Heritage Service following an appraisal by the University of West England (Bristol). SO₂ concentrations were modelled for the 1km² grids covering what was considered to represent the worst case scenario in terms of domestic coal burning. The modelling exercise concluded that it was not possible to conclude that SO₂ emissions arising from domestic fuel combustion, were not likely to exceed the prescribed air quality objective limits within Armagh. This was due to a lack of QA/QC monitoring data required to verify the modelling results for SO₂ emissions. Therefore a supplementary document was required by the EHS in order to verify that a further assessment was not required for SO₂ emissions.

Ratified data was collected for the period October 2003 to January 2004 and a number of QA/QC calibration tests were completed on the automatic monitoring equipment. The equipment had been indicating extremely low levels of SO₂ in the Armagh City area. A subsequent investigation into the reliability of the monitoring equipment identified no technical faults with the equipment or calibration gases. The supplementary document was submitted to the Environment and Heritage Service in January 2005, it was concluded that a progression to a Stage 3 assessment for SO₂ was not necessary at this time.

Armagh City and District Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for SO₂.

NO₂

The Stage 1 review and assessment completed in 2002, concluded that NO₂ emissions required a further Stage 2 assessment on the basis that it was not possible to rule out the risk of exceedences at that time. Following on from the recommendations stated in the Stage 1 Review, Armagh City & District Council, has undertaken monitoring of NO₂ emissions as part of the Stage 2/3 Review & Assessment process.

Armagh City and District Council recently submitted a copy of the Stage 2/3 review and assessment report. The report was accepted and approved by the Environment & Heritage Service following an appraisal by the University of West England (Bristol). The outcome of that review and assessment with regard to NO₂ emissions, is that no further study is required and that a progression to a more detailed Stage 3 assessment was not necessary at this time.

Armagh City and District Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for NO₂.

However, a subsequent appraisal by the University of the West of England (UWE) completed on behalf of the Environment and Heritage Service, determined that there was a potential risk of the objective limits for NO₂ being breached at Mall West Terrace in Armagh City centre.

Following further consultation with UWE, the Council accepted that a further assessment of the emissions at Mall West would be required in order to determine a more accurate presentment of the NO₂ impact on air quality at that location. The subsequent detailed assessment concluded that a declaration of an AQMA was not required at that time. (*See appendix 3 – Detailed Assessment 2007*)

2.0 New Monitoring Data

2.1 Summary of Monitoring Undertaken

Armagh City and District Council undertakes ambient monitoring of the following pollutants in their area:

- **PM₁₀** (by Automatic Air Monitoring Equipment)
- **NO₂** (by Automatic Air Monitoring Equipment & Diffusion Tube)
- **SO₂** (by Automatic Air Monitoring Equipment)

Table 2.1 : Air Quality Monitoring In Armagh

Pollutant	Equipment	Location	Coordinates	Site Ref.
NO₂	Nitrogen Dioxide Diffusion Tubes	25 Railway Street, Armagh	H 875 458	Armagh 1
		Bridge House, Armagh	H 879 450	Armagh 2
		7 Desert Lane, Armagh	H 865 457	Armagh 3
		17, Folly Lane, Armagh	H 882 458	Armagh 4
		St Patrick's Fold Scotch Street, Armagh	H 877 450	Armagh 5
		7 Mallview Terrace, Mall West, Armagh	H 879 452	Armagh 6
		80 Lower Irish Street, Armagh	H 873 447	Armagh 7
		19 Portadown Road, Armagh	H 887 459	Armagh 8
		4 Lonsdale Road	H 876 458	Lonsdale Road A
		4 Lonsdale Road	H 876 458	Lonsdale Road B
		4 Lonsdale Road	H 876 458	Lonsdale Road C
		Mallview Terrace	H 879 452	Mallview Terr A
		Mallview Terrace	H 879 452	Mallview Terr B

No other pollutants covered in the air quality strategy objectives are monitored or required to be monitored in the area covered by Armagh City and District Council.

2.1.1 Automatic Monitoring Stations

PM₁₀

PM₁₀ is the fraction of airborne particles less than 10µm in diameter. These particles can be breathed deeply into the lungs and can carry elements hazardous to human health. PM₁₀ is considered as one of the main pollutants included in the air quality objectives and is responsible for approximately 10,000 premature deaths per year in the UK. Significantly the major sources of PM₁₀ in the UK are considered as Road Transport (25%), Power Stations (15%), Industry (13%) and Mining and Quarrying Activities (10%). Particles may also be transported from other parts of the UK and continental Europe.

There are two Air Quality Objectives associated with PM₁₀ concentrations which have been derived from the EU Stage 1 limit values in the first Air Quality Daughter Directive. These limits are currently referenced in the Local Air Quality Management, Technical Guidance Document TG(03) as 40µg/m³ annual mean and 50µg/m³ as the 24 hour mean not to be exceeded more than 35 days per year (also see Table 1).

Changes to the current limit values are scheduled for implementation in 2010. These limit values have been set by the Department of the Environment Northern Ireland as provisional targets to be achieved by the end of 2010 and are in line with EU Stage 2 limit values to be implemented at the same time. These are 20µg/m³ as the annual mean and 50µg/m³ as the 24 hour mean not to be exceeded more than 7 days per year. However, since these are provisional targets they have not yet been introduced as LAQM regulations. Therefore all emissions data collected is referenced to the current Air Quality Objectives.

Armagh City and District Council has a Rupprecht & Patashnick Continuous Analyser (TEOM series 1400a) located at Lonsdale Road, Armagh City (see Appendix 1). This is considered a kerbside site and is close to a number of residential housing estates and surrounding transport links, including road and bus. The R&P TEOM 1400a, measures particulate matter with a diameter of less than 10µm using a gravimetric air sampling method and can determine mean hourly concentrations. The analyser is housed in an air conditioned and secure cabin. Wind speed and direction are also monitored.

The daily variances of PM₁₀ emissions data can be accessed remotely by both Armagh City and District Council and the Environment & Heritage Service in Belfast via a PC modem/telephone line link up. This system allow exceedences of the objective limits to be identified quickly. It also allows technical errors and equipment malfunctions to be quickly rectified as well as providing a back up data base of results.

SO₂

SO₂ is considered as one of the main air quality objectives and is an associated by-product of combustion processes. Significantly a major source of SO₂ is from Power Stations. Which contribute up to 71% of all the SO₂ emissions in the UK. Domestic fuel usage now only

contributes up to 4% of the total SO₂ emissions, while road transport only accounts for 1% of the total emissions.

There are two Air Quality Objectives associated with SO₂ concentrations which are equivalent to the EU limit values in the first Air Quality Daughter Directive. These limits are currently referenced in the Local Air Quality Management, Technical Guidance Document TG(03) as a 1 hour mean of 350µg/m³, not to be exceeded more than 24 times per year and 125µg/m³ as the 24 hour mean not to be exceeded more than 3 times per year (see Table 1). These objectives were expected to have been reached by the end of 2004.

Armagh City and District Council has a continuous SO₂ analyser (Fluorescent Real-Time Analyser Model 100A) located at Dobbin Street Community Centre in Armagh City centre (see Appendix 1) which is owned and maintained by the Council. This is considered as an urban background site and is close to number of residential housing estates and city centre traffic.

NO₂

NO₂ is an oxide of nitrogen and is considered as one of the main air quality objectives and is a direct by-product of all combustion processes, mostly in the form of nitric oxide. Road transport is the most significant source of NO₂ in the UK comprising 40% of the total UK emissions in 2000. Areas close to motorways, major highways and city centres are therefore more likely to have higher NO₂ concentrations than in any other area.

There are two Air Quality Objectives associated with NO₂ concentrations in Northern Ireland which are, an annual mean of 40µg/m³ and a 1 hour mean of 200µg/m³ not to be exceeded more than 18 times per year. These limits are currently referenced in the Local Air Quality Management, Technical Guidance Document TG(03). It is expected that these objectives are reached by the end of 2005. These limits are similar to the objectives set out in the first Air Quality Daughter Directive by the EU. These regulations have also been adopted into UK legislation and the limits specified are expected to be achieved by 2010.

Armagh City and District Council has a continuous NO₂ analyser (Chemiluminescence Real-Time Analyser Model 200A) located at Lonsdale Road,. The location is a public street in the town centre. This location is close to a number of commercial properties, car parks, busy town centre roadways and surrounding transport links, including the bus station. This is considered as a kerbside site. The continuous analyser, measures nitrogen dioxide levels and can determine mean hourly concentrations. The analyser is housed in an air conditioned and secure cabin. Wind speed and direction are also monitored

QA / QC

Armagh City and District Council currently has a QA/QC and Data Management contract with EMS Ireland and AEANetec. This contract expires in January 2009.

2.1.2 NO₂ Diffusion Tube Monitoring Sites

Armagh City and District Council carries out monitoring of NO₂ by diffusion tubes at 8 sites within their District. The NO₂ diffusion tubes are prepared and analysed by Harwell Scientifics Limited. This laboratory takes part in the NO₂ Network QA/QC Field Intercomparison. The tubes are prepared by coating the grids in a 50% v/v solution of the absorbent, triethanolamine (TEA) in water. Analysis is carried out using a colorimetric technique

All of the information Table 2.1.2 demonstrates the current diffusion tube monitoring program for 2007/2008. Several additional tubes have been added to the program since the last Progress Report submitted by Armagh City and District Council in 2005.

Table 2.1.2: Diffusion Tube Monitoring Site Details in Armagh City

Pollutant	Equipment	Location	Coordinates	Site Ref.
NO ₂	Nitrogen Dioxide Diffusion Tubes	25 Railway Street, Armagh	H 875 458	Armagh 1
		Bridge House, Armagh	H 879 450	Armagh 2
		7 Desert Lane, Armagh	H 865 457	Armagh 3
		17, Folly Lane, Armagh	H 882 458	Armagh 4
		St Patrick's Fold Scotch Street, Armagh	H 877 450	Armagh 5
		7 Mallview Terrace, Mall West, Armagh	H 879 452	Armagh 6
		80 Lower Irish Street, Armagh	H 873 447	Armagh 7
		19 Portadown Road, Armagh	H 887 459	Armagh 8
		4 Lonsdale Road	H 876 458	Lonsdale Road A
		4 Lonsdale Road	H 876 458	Lonsdale Road B
		4 Lonsdale Road	H 876 458	Lonsdale Road C
		Mallview Terrace	H 879 452	Mallview Terr A
		Mallview Terrace	H 879 452	Mallview Terr B

Roadside = 1-5m from kerb, urban background = at least 50m from the kerb of any major road.

2.1.3 SO₂ Diffusion Tube Monitoring Sites

Armagh City and District Council no longer carries out monitoring of SO₂ by diffusion tubes within their District. SO₂ Diffusion tube monitoring was completed for several months during 2002 and 2003. However, the results were considered as insignificant and this method of air quality monitoring was discontinued.

2.2 NEW MONITORING

In April 2007 a diffusion tube previously located at Scotch Street in Armagh, has been relocated to 84 Railway Street, Armagh..

2.3 MONITORING RESULTS AND COMPARISON WITH AQS OBJECTIVES

It has not been possible at this time to generate trend graphs for the data that has been monitored. This is due to the fact that automatic monitoring in the Armagh District Council area only began in July 2002 and consequently there is insufficient data to complete trend data analysis.

2.3.1 PM₁₀ (Automatic Monitoring Station) 2003 to 2004

Data Summary – Lonsdale Road 1st January 2003 to 31st December 2003

Ratified data capture of 100% for PM₁₀ was reported over the period 1st January to 31st December 2003. Data capture during this monitoring period met the review and assessment target of 90% for ratified data set.

PM₁₀ concentrations were recorded in the DoE Northern Ireland MODERATE band on 39 occasions on 3 days in December 2003. The DoE Northern Ireland objective value of 50 µg/m³ based on daily gravimetric equivalent data was exceeded on 46 occasions during the period. The objective allows up to 35 exceedences in a year. The mean concentration of 33µg/m³ gravimetric equivalent was below the DoE Northern Ireland annual mean objective value of 40 µg/m³.

Table 2.3.1 PM₁₀ exceedences at Lonsdale Road, Armagh - 1st January 2003 to 31st December 2003

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
PM ₁₀ Particulate Matter (Gravimetric)	Daily Mean > 50 µg/m ³	46	46
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 40 µg/m ³	0	-

Data Summary – Lonsdale Road 1st January 2004 to 31st December 2004

Ratified data capture of 99.4% for PM₁₀ was reported over the period 1st January to 31st December 2004. Data capture during this monitoring period met the review and assessment target of 90% for ratified data sets. There was no significant data losses across the period.

PM₁₀ concentrations were recorded in the DoE Northern Ireland LOW band throughout the period. The DoE Northern Ireland objective value of 50 µg/m³ based on daily gravimetric equivalent data was not exceeded during the period. The mean TEOM concentration of 33 µg/m³ gravimetric equivalent was below the DoE Northern Ireland annual mean objective value of 40 µg/m³.

Table 2.3.2: PM₁₀ exceedences at Lonsdale Road, Armagh - 1st January 2004 to 31st December 2004

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
PM ₁₀ Particulate Matter (Gravimetric)	Daily Mean > 50 µg/m ³	15	15
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 40 µg/m ³	0	-

2.3.2 SO₂ (Automatic Monitoring Station)

Data Summary – Dobbin Street, Armagh 18th February 2003 to 31st December 2003

Ratified data capture of 41% for SO₂ was reported over the period 18th February 2003 to 31st December 2003. Data capture during this monitoring period did not meet the review and assessment target of 90% for ratified data sets. There was no significant data loss across the period. However where the data capture target is not met, the results should be treated with caution.

SO₂ concentrations were recorded in the DoE Northern Ireland LOW band throughout the period. The maximum 15 minute mean of 154 µg/m³ was below the DoE Northern Ireland 15 minute objective value of 266 µg/m³. The maximum hourly mean of 82 µg/m³ was below the DoE Northern Ireland hourly objective value of 350 µg/m³. The maximum daily mean of 14 µg/m³ was below the DoE Northern Ireland daily objective of 125 µg/m³.

Table 2.3.3: SO₂ exceedences at Dobbin Street, Armagh - 18th February 2003 to 31st December 2003

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Sulphur Dioxide	15-Minute Mean > 266 µg/m ³	0	0
Sulphur Dioxide	Hourly Mean > 350 µg/m ³	0	0
Sulphur Dioxide	Daily Mean > 125 µg/m ³	0	0

Data Summary – Dobbin Street, Armagh 1st January 2004 to 31st December 2004

Ratified data capture of 97% for SO₂ was reported over the period 1st January 2004 to 31st December 2004. Data capture during this monitoring period met the review and assessment target of 90% for ratified data sets. There was no significant data loss across the period.

SO₂ concentrations were recorded in the DoE Northern Ireland LOW band throughout the period. The maximum 15 minute mean of 43 µg/m³ was below the DoE Northern Ireland 15 minute objective value of 266 µg/m³. The maximum hourly mean of 32 µg/m³ was below the DoE Northern Ireland hourly objective value of 350 µg/m³. The maximum daily mean of 9 µg/m³ was below the DoE Northern Ireland daily objective of 125 µg/m³.

Table 2.3.4: SO₂ exceedences at Dobbin Street, Armagh - 1st January 2004 to 31st December 2004

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Sulphur Dioxide	15-Minute Mean > 266 µg/m ³	0	0
Sulphur Dioxide	Hourly Mean > 350 µg/m ³	0	0
Sulphur Dioxide	Daily Mean > 125 µg/m ³	0	0

2.3.3 NO₂ (Automatic Monitoring Station)

Data Summary – Lonsdale Road 1st January 2003 to 31st December 2003

Ratified data capture of 98% for NO₂ was reported over the period 1st January 2003 to 31st December 2003. Data capture during this monitoring period met the review and assessment target of 90% for ratified data sets. There was no significant data loss across the period.

NO₂ concentrations were recorded in the Defra LOW band throughout the period. The maximum hourly mean of 374 µg/m³ was above the DoE Northern Ireland hourly objective value of 200 µg/m³. The mean concentration of 34µg/m³ was below the DoE Northern Ireland annual objective of 40 µg/m³.

Table 2.3.5: NO₂ exceedences at Lonsdale Road, Armagh – 1st January 2003 to 31st December 2003

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual Mean > 40 µg/m ³	0	-
Nitrogen Dioxide	Hourly Mean > 200 µg/m ³	11	11

Data Summary – Lonsdale Road 1st January 2004 to 31st December 2004

Ratified data capture of 91% for NO₂ was reported over the period 1st January 2004 to 31st December 2004. Data capture during this monitoring period met the review and assessment target of 90% for ratified data sets. Significant data loss during the period were:

- 16 days of NO_x data deleted between 20th July and 4th August 2004 due to analyser fault.

NO₂ concentrations were recorded in the Defra LOW band throughout the period. The maximum hourly mean concentration of 118 µg/m³ was below the DoE Northern Ireland hourly objective value of 200 µg/m³. The annual mean concentration of 32 µg/m³ was below the DoE Northern Ireland daily objective of 40 µg/m³.

Table 2.3.6: NO₂ exceedences at Lonsdale Road, Armagh - 1st May 2004 to 31st October 2004

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual Mean > 40 µg/m ³	0	-
Nitrogen Dioxide	Hourly Mean > 200 µg/m ³	0	0

2.3.4 PM₁₀ NO₂ & SO₂ Results (Automatic Monitoring Station Lonsdale Road) 2005 to 2007

No PM₁₀ data is available for Lonsdale Road for the monitoring year 2007. Armagh City and District Council discovered a problem with the PM₁₀ monitor during consultations with AEANetcen when the data downloaded from the station was being ratified for the purposes of inclusion in this progress report. Further consultation with AEANetcen and EMS Ireland ascertained that there had been an on-going undetectable fault with the analogue board within the electronic circuits of the PM₁₀ monitor. The data downloaded from the station was demonstrating an unusually high number of exceedences which was not commensurate with the level of exceedences experienced during the 2006 monitoring schedule. EMS has since rectified this problem as of March 2008. Unfortunately the data that has been recovered from the station for 2007 is not representative of the ambient PM₁₀ emissions at Lonsdale Road and there has not been submitted as part of this report. The EHS (PEPG) in Belfast was made aware of this issue when the situation became critical and a report was issued to them outlining a log of events and time line regarding these developments. Historical data from the previous years of monitoring at Lonsdale Road demonstrates that there is unlikely to have been a breach of the number of exceedences for PM₁₀ at this location. The Council is quite confident that this would be the situation for 2007 also and that no further assessment or declaration of an AQMA would have been necessary at this time. The Council is now looking into ways in which the process of identifying technical failures at the monitoring station can be dealt with in a swift manner so as to reduce the impact on the monitoring schedule.

ARMAGH LONSDALE ROAD 01 January to 31 December 2005

These data have been fully ratified by AEA Energy & Environment

POLLUTANT	NO _x	NO	NO ₂	PM ₁₀ *+
Number Very High	-	-	0	0
Number High	-	-	0	0
Number Moderate	-	-	0	62
Number Low	-	-	6969	7075
Maximum 15-minute mean	1280 µg m ⁻³	713 µg m ⁻³	317 µg m ⁻³	286 µg m ⁻³
Maximum hourly mean	1148 µg m ⁻³	631 µg m ⁻³	202 µg m ⁻³	220 µg m ⁻³
Maximum running 8-hour mean	630 µg m ⁻³	335 µg m ⁻³	131 µg m ⁻³	161 µg m ⁻³
Maximum running 24-hour mean	417 µg m ⁻³	218 µg m ⁻³	93 µg m ⁻³	82 µg m ⁻³
Maximum daily mean	400 µg m ⁻³	208 µg m ⁻³	93 µg m ⁻³	80 µg m ⁻³
Average	83 µg m ⁻³	33 µg m ⁻³	33 µg m ⁻³	26 µg m ⁻³
Data capture	79.6 %	79.6 %	79.6 %	81.9 %

* PM₁₀ Indicative Gravimetric Equivalent µg m⁻³

+ PM₁₀ as measured by a TEOM using a factor of 1.3 to give Indicative Gravimetric Equivalent

All mass units are at 20°C and 1013mb

NO_x mass units are NO_x as NO₂ µg m⁻³

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m ⁻³	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m ⁻³	1	1
PM ₁₀ Particulate Matter (Gravimetric)	Daily mean > 50 µg m ⁻³	8	8
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 40 µg m ⁻³	0	-

2.3.5 PM₁₀NO₂ Results (Automatic Monitoring Station Lonsdale Road) 2006

ARMAGH LONSDALE ROAD 01 January to 31 December 2006

These data have been fully ratified by AEA Energy & Environment

POLLUTANT	NO _x	NO	NO ₂	PM ₁₀ *+
Number Very High	-	-	0	0
Number High	-	-	0	0
Number Moderate	-	-	0	139
Number Low	-	-	6804	8554
Maximum 15-minute mean	1180 µg m ⁻³	638 µg m ⁻³	208 µg m ⁻³	607 µg m ⁻³
Maximum hourly mean	1031 µg m ⁻³	560 µg m ⁻³	176 µg m ⁻³	239 µg m ⁻³
Maximum running 8-hour mean	522 µg m ⁻³	273 µg m ⁻³	112 µg m ⁻³	152 µg m ⁻³
Maximum running 24-hour mean	360 µg m ⁻³	175 µg m ⁻³	96 µg m ⁻³	83 µg m ⁻³
Maximum daily mean	318 µg m ⁻³	157 µg m ⁻³	89 µg m ⁻³	80 µg m ⁻³
Average	89 µg m ⁻³	36 µg m ⁻³	35 µg m ⁻³	29 µg m ⁻³
Data capture	77.7 %	77.7 %	77.7 %	98.7 %

* PM₁₀ Indicative Gravimetric Equivalent $\mu\text{g m}^{-3}$
 + PM₁₀ as measured by a TEOM using a factor of 1.3 to give Indicative Gravimetric Equivalent
 All mass units are at 20°C and 1013mb
 NO_x mass units are NO_x as NO₂ $\mu\text{g m}^{-3}$

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 $\mu\text{g m}^{-3}$	0	-
Nitrogen Dioxide	Hourly mean > 200 $\mu\text{g m}^{-3}$	0	0
PM ₁₀ Particulate Matter (Gravimetric)	Daily mean > 50 $\mu\text{g m}^{-3}$	24	24
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 40 $\mu\text{g m}^{-3}$	0	-

Produced by AEA Energy & Environment on behalf of Armagh District Council

2.3.6 NO₂ Results (Automatic Monitoring Station Lonsdale Road) 2007 (Provisional)

ARMAGH LONSDALE ROAD 01 January to 31 December 2007

These data are provisional from 01/01/2007 and may be subject to further quality control

POLLUTANT	NO _x	NO	NO ₂
Number Very High	-	-	0
Number High	-	-	0
Number Moderate	-	-	0
Number Low	-	-	8695
Maximum 15-minute mean	1039 $\mu\text{g m}^{-3}$	580 $\mu\text{g m}^{-3}$	254 $\mu\text{g m}^{-3}$
Maximum hourly mean	850 $\mu\text{g m}^{-3}$	453 $\mu\text{g m}^{-3}$	176 $\mu\text{g m}^{-3}$
Maximum running 8-hour mean	544 $\mu\text{g m}^{-3}$	269 $\mu\text{g m}^{-3}$	134 $\mu\text{g m}^{-3}$
Maximum running 24-hour mean	341 $\mu\text{g m}^{-3}$	168 $\mu\text{g m}^{-3}$	90 $\mu\text{g m}^{-3}$
Maximum daily mean	335 $\mu\text{g m}^{-3}$	164 $\mu\text{g m}^{-3}$	85 $\mu\text{g m}^{-3}$
Average	82 $\mu\text{g m}^{-3}$	34 $\mu\text{g m}^{-3}$	31 $\mu\text{g m}^{-3}$
Data capture	99.3 %	99.3 %	99.3 %

All mass units are at 20°C and 1013mb
 NO_x mass units are NO_x as NO₂ $\mu\text{g m}^{-3}$

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 $\mu\text{g m}^{-3}$	0	-
Nitrogen Dioxide	Hourly mean > 200 $\mu\text{g m}^{-3}$	0	0

Produced by AEA Energy & Environment on behalf of Armagh District Council

ARMAGH DOBBIN STREET 01 January to 31 December 2005

These data have been fully ratified by AEA Energy & Environment

POLLUTANT	SO ₂
Number Very High	0
Number High	0
Number Moderate	1
Number Low	7140
Maximum 15-minute mean	442 µg m ⁻³
Maximum hourly mean	112 µg m ⁻³
Maximum running 8-hour mean	14 µg m ⁻³
Maximum running 24-hour mean	6 µg m ⁻³
Maximum daily mean	6 µg m ⁻³
Average	1 µg m ⁻³
Data capture	20.8 %

All mass units are at 20°C and 1013mb

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

Produced by AEA Energy & Environment on behalf of Armagh District Council

2.4.1 NO₂ (Diffusion Tube Monitoring)

NO₂ diffusion tube monitoring results have been bias corrected for monitoring carried out from 2003 to 2007. Nitrogen Dioxide concentrations recorded by the diffusion tubes indicate that Nitrogen Dioxide concentrations currently comply with the annual mean Air Quality Strategy objective at all measurement locations except those at Mallview Terrace and 84 Railway Street, Armagh City. **Therefore, following consultation with the relevant authorities, Armagh City and District Council will be declaring (under article 12(1) The Environment Northern Ireland) Order 2002) an Air Quality Management Area (AQMA) that incorporates both of these sites.**

Tables 1 to 5 in Appendix B, list the results for NO₂ diffusion tubes from 2003 and 2007.

2.5.1 SO₂ (Diffusion Tube Monitoring)

There is currently no SO₂ diffusion tube monitoring being completed in Armagh at this time.

3.0 New Developments – Since the First Stage Review & Assessment

3.1 Industrial Processes

3.1.1 Part A Industrial Processes

No new Part A processes were authorised for operation.

3.1.2 Part B Industrial Processes

No new Part B industrial processes were authorised in Armagh. No previously existing Part B processes underwent significant changes likely to increase their emissions by 30% or more.

3.1.3 Part C Industrial Processes

Armagh City and District Council have not issued any Part C authorisations between 1st January and 31st December 2007.

3.1.4 Other Industrial Processes

3.1.4.1 New landfill, Quarrying and Mineral Processes

No new landfill, quarrying or mineral processes have started operation or significantly changed.

3.1.4.2 New Fuel Storage Depots

No new major fuel storage depots, either in or close to the Armagh district, have been identified.

3.1.4.3 Small Boilers

Armagh City and District Council are not aware of any significant changes to >5MW_(thermal) fuel plants and processes.

3.1.4.4 IPPC Permits

There were no IPPC permits issued by The Environment and Heritage Service between 1st January and 31st December 2007

3.1.4 Industrial Process Closures

Armagh City and District Council have not identified any process closures within the District.

3.2 Transport

3.2.1 New Road Developments

No new roads have been constructed or proposed since the previous Updating and Screening Report in February 2004.

3.2.2 Significant Changes to Existing Roads

Armagh City and District Council identified no significant road layout changes or roadwork's.

3.2.3 Newly Identified Public Exposure to Vehicle Emissions

No roads have been identified with annual average daily traffic flow (AADTF) greater than 10,000 vehicles per day, which have experienced large increases (25% or more) in traffic flow, since the previous Updating and Screening Report. Local Authorities are required to consider whether there are any of the following in their area, either new since the last Report, or newly identified:

1. Narrow congested streets meeting the following criteria:
 - Residential properties are within 5m of the kerb.
 - Average traffic speeds are 50kph or less.
 - The carriageway is less than 10m wide, and
 - AADTF is greater than 10,000.
2. Busy streets where people may spend 1 hour or more close to traffic (most likely in streets of shops, bars, cafes etc.), meeting the following criteria:
 - Public exposure for 1 hour or more within 5m of the kerb
 - AADT > 10,000 vehicles per day.

The Updating and Screening Assessment of March 2004 identified no roads in Armagh meeting these criteria. There are no new, or newly identified streets meeting these criteria since the previous report.

3.2.4 Other Transport Sources

As well as road vehicles, public exposure to emissions from planes, buses, trains, ships etc. must also be considered.

3.2.4.1 Trains

There are no new, or newly identified, locations where diesel locomotives are regularly stationary for five minutes or more and -

- There is potential for public exposure within 15m of the locomotives
- There are more than two occasions a day when diesel locomotives are stationary with engines running for more than 15 minutes.

3.2.4.2 Airports

There are no airports in Armagh or neighbouring authorities that have a throughput of 5 million passengers per year and/or 500,000 tonnes of freight.

3.2.4.3 Bus Stations

The main bus stations within the Armagh district have less than 1000 bus movements per day. There are no newly identified bus stations with more than 1000 bus movements per day, and no bus stations where movements have increased to more than 1000 per day since the previous Updating and Screening Report.

3.2.4.4 Shipping

Armagh is inland and has no ports with more than 5,000 shipping movements per year

3.3 Residential, Commercial and Public

3.3.1 New Housing Developments

There are no new significant housing developments proposed for the Armagh City and District Council area.

3.3.2 New Commercial Developments

There are no new commercial developments (e.g. retail parks, office blocks, leisure centres).

3.3.3 New Public Developments

New public developments such as schools, hospitals, stations, major car parks require consideration as they may impact on local traffic flow.

No new public developments have been confirmed since the previous Updating and Screening Assessment.

4.0 Conclusions and Recommendations

4.1 Conclusions from New Monitoring Data

This Progress Report has identified that there have been exceedences of the prescribed annual mean limit of 40ug/m³ for Nitrogen Dioxide (NO₂) at two monitoring sites within Armagh City. These locations are at Mallview Terrace on Mall West and 84 Railway Street. Therefore, Armagh City & District Council will in due process declare an Air Quality Management Area (AQMA) that includes both these monitoring locations. It is envisaged that any such AQMA will also incorporate other monitoring locations at Railway Street and Lonsdale Road since there is a linear flow of traffic linking them to the locations that have exceeded the statutory limits.

4.2 Recommendations

Armagh City and District Council shall in due course and in accordance with Article 12-(1) of the Environment (Northern Ireland) Order 2002, declare an Air Quality Management Area that incorporates the locations in exceedence of the statutory limits for nitrogen dioxide emissions; and any further locations inter-related to those exceedences such as direct feeder roads.

Passive sampling by diffusion tubes are a simple cost effective method of monitoring and checking air quality in an area. It is recommended that the NO₂ & PM₁₀ monitoring should be continued, targeting problem areas. The diffusion tube survey will comply with the objectives and sampling methods as set out in LAQM TG(03). That the NO₂ diffusion tube network be extended where necessary in light of future screening.

Armagh City and District Council currently has its Air Quality Management Strategy in place and is working to fulfil the objectives that were initiated as part of the Strategy. The Strategy is currently at the end of its second year since being launched in March 2006 and the council has been involved in a successful 'Walk to School' campaign to highlight the issues of air pollution and road traffic caused by the school run. The council is also registered on the DOE Travelwise 'Carshare' scheme. Since local air quality management work by the council has to date indicated that the District enjoys a relatively good standard of air quality, it is anticipated that the strategy will focus on protecting this position for the future

APPENDIX A

ARMAGH CITY AND DISTRICT COUNCIL

Local Air Quality Monitoring Map

APPENDIX B

NO_x DATA

ARMAGH CITY AND DISTRICT COUNCIL
2003 to 2007

Table 1: Armagh City and District Council NO₂ Diffusion Tube Results 2003

NO ₂ DIFFUSION TUBE RESULTS 2003 µg/m ³								
Month	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8
JANUARY	51	36	32	25	23	44	49	57
FEBRUARY	35	39	30	26	23	30	30	25
MARCH	15	23	18	10	12	21	27	28
APRIL	9	23	NR	11	11	26	16	27
MAY	17	39	11	15	6	33	37	32
JUNE	32	40	13	3	17	25	26	27
JULY	25	37	10	14	15	47	27	32
AUGUST	25	39	12	15	18	46	33	42
SEPTEMBER	35	42	13	22	20	63	38	33
OCTOBER	38	39	20	28	27	67	27	50
NOVEMBER	36	46	20	21	24	73	31	30
DECEMBER	54	53	28	35	38	78	49	41
Mean	31	38	19	19	19	46	33	35

Table 2: Armagh City and District Council NO₂ Diffusion Tube Results 2004

NO ₂ DIFFUSION TUBE RESULTS 2004 µg/m ³								
	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8
JANUARY	45	35	17	25	25	68	39	20
FEBRUARY	40	44	19	27	19	69	36	NS
MARCH	37	41	15	32	22	67	36	31
APRIL	33	42	12	18	20	57	31	NS
MAY	30	41	13	18	17	NS	36	40
JUNE	21	28	9	10	8	34	18	21
JULY	18	29	7	14	11	40	29	26
AUGUST	21	35	11	15	13	34	30	25
SEPTEMBER	28	34	10	14	16	55	32	33
OCTOBER	37	44	18	24	NS	55	40	42
NOVEMBER	40	43	14	23	22	55	42	46
DECEMBER	40	39	15	20	23	69	34	31
Mean	32	38	13	20	18	55	33	32

Table 3: Armagh City and District Council NO₂ Diffusion Tube Results 2005

Month	NO2 DIFFUSION TUBE RESULTS 2005							
	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8
January	36	24	14	19	18	55	33	37
February	39	49	19	24	22	68	39	45
March	34	40	14	22	21	63	34	37
April	NR	37	15	16	19	67	1	35
May	27	40	12	15	<0.6	52	32	38
June	26	39	10	13	15	54	37	32
July	27	35	9	12	12	43	32	31
August	33	.5.5	10	16	16	47	38	33
September	39	43	11	19	20	54	41	34
October								
November	45	44	13	25	23	70	40	35
December	49	47	17	26	27	73	44	42
MEAN	35	40	13	19	19	59	34	36
BIAS MEAN	31	35	12	16	17	52	30	32

Table 4: Armagh City and District Council NO₂ Diffusion Tube Results 2006

NO2 DIFFUSION TUBE RESULTS 2006(ug/m3)

	Armagh 1	Armagh 2	Armagh 3	Armagh 4	Armagh 5	Armagh 6	Armagh 7	Armagh 8
JANUARY	41.8	42.2	10.5	18	26.6	57.3	38.3	35.3
FEBRUARY	38.4	49.4	17.8	25.9	24.8	56.7	44.8	44
MARCH	36.3	44.5	17.4	22.8	24	67.7	33.7	41.9
APRIL	35.3	45.2	11.1	19.5	17.1	63.2	35	39.1
MAY	32	42.9	12.8	17.6	17.9	63.1	39.3	39.9
JUNE	35.7	44.9	11.9	NR	17.7	58.2	40.5	41.5
JULY	28.4	40.3	10.4	12.4	14.6	52.5	34.3	29.4
AUGUST	32.3	32.1	NR	15	12.2	56.6	34	42.3
SEPTEMBER	36.6	44	NR	17.6	20.7	67.1	35	31.2
OCTOBER	48	51	15.2	21.1	22.6	75	41.7	39.2
NOVEMBER	52.4	50.1	14.1	21.9	24.9	100.6	44.8	39.4
DECEMBER	49.3	46.5	15.6	20.9	23.3	96.4	43.5	34.4
AVERAGE	38.88	44.43	13.68	19.34	20.53	67.87	38.74	38.13
Ave Bias Adj	30	35	11	15	16	53	30	30

Table 5: NO₂ Diffusion Tube Results For 10 sites in Armagh from November 06 to September 07 analysed by Harwell Scientifics Ltd

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	Mallview Terrace (existing)	Mallview Terrace A	Mallview Terrace B	SITE 7	SITE 8	Lonsdale Road A	Lonsdale Road B	Lonsdale Road C
NOVEMBER 2006	52	50	14	22	25	101	62	55	45	39	38	44	51
DECEMBER 2006	49	47	16	21	23	96	58	52	44	34	49	47	30
JANUARY 2007	42	38	12	19	19	80	51	46	34	37	40	34	37
FEBRUARY 2007	53	48	20	29	29	84	62	56	44	37	46	50	49
MARCH 2007	44	37	8	17	25	61	60	55	39	NR	38	43	48
APRIL 2007	41	52	16	19	65	74	53	45	45	41	43	39	44
MAY 2007	26	45	12	13	43	NR	48	42	37	35	31	27	30
JUNE 2007	26	40	12	12	49	50	45	41	NR	NR	35	41	37
JULY 2007	27	36	7	9	51	35	44	34	39	36	30	33	31
AUGUST 2007	34	33	9	13	56	43	45	41	39	38	35	35	37
SEPTEMBER 2007	38	40	11	18	27	30	55	49	22	25	21	23	22
AVERAGE	39	42	12	32	37	65	53	47	39	36	37	38	38
Bias Ave	29	31	9	23	28	48	39	26	27	28	28	28	28

Table 6: Armagh City and District Council NO₂ Diffusion Tube Results January to December 2007

NO2 DIFFUSION TUBE RESULTS JANUARY to DECEMBER 2007 (ug/m3)													
	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	L RD A	L RD B	L RD C	MT A	MT B
JANUARY	42	38	12	19	-	80	34	37	40	34	37	51	46
FEBRUARY	53	48	20	29	-	84	44	37	46	50	49	62	56
MARCH	44	37	8	173	-	61	39	NR	38	43	48	60	55
APRIL	41	52	16	19	65	74	45	41	43	39	44	53	45
MAY	26	45	12	13	43	NR	37	35	31	27	30	48	42
JUNE	26	40	12	12	49	50	NR	NR	35	41	37	45	41
JULY	27	36	7	9	51	35	39	36	30	33	31	44	34
AUGUST	34	33	9	13	56	43	39	38	35	35	37	45	41
SEPTEMBER	38	40	11	18	27	30	22	25	21	23	22	55	49
OCTOBER	53	53	19	22	73	77	47	37	50	53	52	61	55
NOVEMBER	50	51	14	23	68	74	47	52	46	48	52	62	57
DECEMBER	47	48	20	25	61	57	43	42	46	47	44	54	58
AVERAGE	40	43	13	31	55	61	39	38	38	39	40	53	48
Bias Ave	32	34	10	25	44	48	31	30	30	31	32	42	38

Lonsdale Average Bias Adj	31
Mallview Terrace Average Bias Adj	43

02/04/07 - SITE 5 MOVED FROM ST PATRICKS FOLD TO 84 RAILWAY ST

Bias Factor Derived from co-located triplicate diffusion tubes at NO₂ automatic monitor on Lonsdale Road.

2007 NO₂ Average from Automatic Analyser = 31 ug/m²

2007 NO₂ Average from Triplicate Diffusion Tubes = 39 ug/m²

Bias factor from co-location Study - 31/39 = 0.79

Appendix C

Detailed Assessment Report on NO2 Emissions **Mall West Armagh 2007**

Armagh City and District Council

Detailed Assessment for NO₂ Diffusion Tubes
on Mall West, Armagh City.

November 2007

Executive Summary

Armagh City and District Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for any of the prescribed pollutants under review.

However, a subsequent appraisal by the University of the West of England (UWE) completed on behalf of the Environment and Heritage Service, determined that there was a potential risk of the objective limits for NO₂ being breached at Mall West Terrace in Armagh City centre.

Following further consultation with UWE, the Council accepted that a further assessment of the emissions at Mall West would be required in order to determine a more accurate presentment of the NO₂ impact on air quality at that location.

In order to get a more accurate representation of the extent of NO₂ pollution within Mall West, 2 additional diffusion tubes were placed at this location to complement the existing tube. This was situated on a bus stop approximately 200m along Mall West from the junction with Barrack Street. The additional tubes were to be situated at the new location for an initial period of six months.

Following the six month evaluation of NO₂ pollution in Mall West it was determined in March 2007 that there may also be a possible breach of the objective limits at both Barrack Street and Railway Street. The decision was taken to transfer an existing diffusion tube located at Scotch Street to Railway Street (close to the Moy Road roundabout). This arrangement now gave the Council the opportunity to determine a linear representation of NO₂ levels along the busiest through-route in the city. Railway Street, Mall West and Barrack Street are all linked in this order running from North to South.

Another outcome of the six month evaluation was that the Council resolved that it would be more prudent to extend the monitoring period at Mall West for a further six months. This was based on the assertion that 12 months worth of data would be much more beneficial to the overall accuracy of the monitoring scheme and; that estimating annual average results using the method highlighted in LAQM TG(03) Box 6.5 could actually lead to an inaccurate estimation of the annual mean. Considering that previous diffusion tube results had demonstrated that the results for Mall West were critically close to breaching the objective limits for NO₂, a more cautious approach was required for greater acuity in concluding whether an AQMA should be declared or not.

The results of the 12 month monitoring period were subsequently adjusted using a bias factor that was derived from a co-location study that was already being carried out at the automatic monitoring station on Lonsdale Road. Three NO₂ diffusion tubes were placed in situ at the station in conjunction with the permanent NO₂ automatic analyser. The results gained from this study presented the Council with its own local bias adjustment factor of 0.78. Coincidentally, this factor is exactly equivalent to the bias factor given by the R&A Support section of The University of West England's

website, which determines a factor based on a number of studies across the UK in the given year.

Following the adjustment of the diffusion tube results by the bias factor gained from Armagh's own collocation study, it was found that none of the diffusion tubes at any of the locations studied had breached the objective limits for NO₂, >40ug/m².

It is therefore considered by Armagh City and District Council that an Air Quality Management Area (AQMA) **will not be** declared for Mall West.

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1.0 Introduction

Armagh City and District Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for any of the prescribed pollutants under review.

However, a subsequent appraisal by the University of the West of England (UWE) completed on behalf of the Environment and Heritage Service, determined that there was a potential risk of the objective limits for NO₂ being breached at Mall West Terrace in Armagh City centre.

Following further consultation with UWE, the Council accepted that a further assessment of the emissions at Mall West would be required in order to determine a more accurate presentment of the NO₂ impact on air quality at that location.

In order to get a more accurate representation of the extent of the NO₂ pollution within Mall West, 2 additional diffusion tubes were placed at this location to complement the existing tube, which was situated on a bus stop approximately 200m along Mall West, from the junction with Barrack Street. The additional tubes were situated at the new location for an initial period of six months.

Following the six month evaluation of NO₂ pollution in Mall West it was determined in March 2007 that there may also be a possible breach of the objective limits at both Barrack Street and Railway Street. The decision was taken to transfer an existing diffusion tube at Scotch Street to Railway Street (close to the Moy Road roundabout). This arrangement now gave the Council the opportunity to determine a linear representation of NO₂ levels along the busiest through-route in the City. Railway Street, Mall West and Barrack Street are all linked in this order running from North to South.

Another outcome of the six month evaluation was that the Council resolved that it would be more prudent to extend the monitoring period at Mall West for a further six months. This was based on the assertion that 12 months worth of data would be much more beneficial to the overall accuracy of the monitoring scheme and: that estimating annual average results using the method highlighted in LAQMTG(03) Box 6.5 could actually lead to an inaccurate estimation of the annual mean. Considering that previous diffusion tube results had demonstrated that the results for Mall West were critically close to breaching the objective limits for NO₂, a more cautious approach was required for greater acuity in concluding whether an AQMA should be declared or not.

2.0 RESULTS

Presented in Table 1 below are the results of the NO₂ diffusion tube monitoring surveys carried out in Armagh from November 2006 to the end of September 2007.

Table 1: NO₂ Diffusion Tube Results For 10 sites in Armagh from November 06 to September 07 analysed by Harwell Scientifics Ltd

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	Mallview Terrace (existing)	Mallview Terrace A	Mallview Terrace B	SITE 7	SITE 8	Lonsdale Road A	Lonsdale Road B	Lonsdale Road C
NOVEMBER 2006	52	50	14	22	25	101	62	55	45	39	38	44	51
DECEMBER 2006	49	47	16	21	23	96	58	52	44	34	49	47	30
JANUARY 2007	42	38	12	19	19	80	51	46	34	37	40	34	37
FEBRUARY 2007	53	48	20	29	29	84	62	56	44	37	46	50	49
MARCH 2007	44	37	8	17	25	61	60	55	39	NR	38	43	48
APRIL 2007	41	52	16	19	65	74	53	45	45	41	43	39	44
MAY 2007	26	45	12	13	43	NR	48	42	37	35	31	27	30
JUNE 2007	26	40	12	12	49	50	45	41	NR	NR	35	41	37
JULY 2007	27	36	7	9	51	35	44	34	39	36	30	33	31
AUGUST 2007	34	33	9	13	56	43	45	41	39	38	35	35	37
SEPTEMBER 2007	38	40	11	18	27	30	55	49	22	25	21	23	22
AVERAGE	39	42	12	32	37	65	53	47	39	36	37	38	38
Bias Ave	29	31	9	23	28	48	29	26	27	28	28	39	35

Mall West and Lonsdale Road co-location study results

Table 2: Bias Adjusted Averages for Mallview Terrace and Lonsdale Road Sites in Armagh from November 2006 to end of September 2007

Month	Mallview Terrace (existing)	Mallview Terrace A	Mallview Terrace B	Lonsdale Road A	Lonsdale Road B	Lonsdale Road C
November 2006	101	62	55	38	44	51
December 2006	96	58	52	49	47	30
January 2007	80	51	46	40	34	37
February 2007	84	62	56	46	50	49
March 2007	61	60	55	38	43	48
April 2007	74	53	45	43	39	44
May 2007	NR	48	42	31	27	30
June 2007	50	45	41	35	41	37
July 2007	35	44	34	30	33	31
August 2007	43	45	41	35	35	37
September 2007	30	55	49	21	23	22
Mean	65	53	47	37	38	38
Bias Adjusted (0.74)	48	39	35	27	28	28

Table 2 above outlines the NO₂ diffusion tube results for Mallview Terrace and Lonsdale Road in Armagh. Mallview Terrace is the location where it was assumed that NO₂ levels were likely to breach the objective limits. The tubes at Lonsdale Road are part of a co-location study with the NO₂ automatic analyser. This co-location study was used to achieve the bias factor needed to adjust the raw data provided by Harwell Scientifics Ltd.

It is clear that the result for the 'existing' Mallview Terrace site is of a much higher value than Mallview Terrace sites A & B. This is due to the fact that the diffusion tube at the existing site is situated on a bus stop pole at the kerbside and not with the other two tubes on the façade of the nearest dwelling. Taking this into consideration it was decided not to use this tube in the overall evaluation of the level of NO₂ at Mallview Terrace, since the result would not be representative of the levels at the nearest sensitive receptor. However this tube does give the Council an indication of the 'drop out' of NO₂ emissions from the atmosphere at a distance of over 5 metres. Therefore only the results presented for Mallview Terrace A & B were used in this detailed assessment to determine if an AQMA would be declared. In future, the diffusion tube situated on the bus stop pole at Mall West will be relocated and placed with tubes A & B on the façade.

Bias Factor Determination

As previously stated, the bias factor used to re-adjust the raw data from the diffusion tube analysis carried out by Harwell Scientifics Ltd was generated from the co-location of triplicate sampling tubes at the Lonsdale Road monitoring site. AEA NETCEN ratified all of the monitoring data from the automatic analyser over the period November 2006 to September 2007, which is a matched period in line with the advisory note in Box 6.4 of LAQM TG(03). The average NO₂ result was **28 ug/m³**. (See Appendix 2). The average diffusion tube result of the co-located tubes was **38**

ug/m³. To obtain a bias adjustment factor it is necessary to divide the automatic monitoring results by the average diffusion tube result, in this instance giving **a bias factor of 0.74**. This method is highlighted in LAQM TG(03) in Box 6.4, section 6-7. This bias factor result is similar to the factor presented on the University of the West of England spreadsheet at <http://www.uwe.ac.uk/aqm/review/diffusiontube300907.xls>. The spreadsheet showed a result of 0.78. Given the similarity of both results, the Council felt confident enough to use its own bias factor from the co-location study. Furthermore, it was felt that the Lonsdale Road co-location study was a better barometer of local air quality in Armagh City.

Table 3: Average NO₂ level at Mallview Terrace following bias adjustment

Month	Mallview Terrace A	Mallview Terrace B
November 2006	62	55
December 2006	58	52
January 2007	51	46
February 2007	62	56
March 2007	60	55
April 2007	53	45
May 2007	48	42
June 2007	45	41
July 2007	44	34
August 2007	45	41
September 2007	55	49
Mean	53	47
Bias Adjusted (0.74)	39	35
Average ug/m ³	37	

3.0 Conclusions

The result in Table 3 shows that there is not a breach of the objective limit of 40 $\mu\text{g}/\text{m}^3$ for NO_2 at Mallview Terrace, Armagh and Armagh City and District Council will not be declaring an AQMA for this location.

4.0 Recommendations

It is recommended that the Council continues to monitor NO_2 emissions at Mallview Terrace using the triplicate sampling method. From the 28th of November, the three diffusion tubes at Mallview Terrace will be put together at the one position on the façade of the building currently supporting two of the tubes.

The Council will also continue to co-locate three NO_2 diffusion tubes at the Lonsdale Road automatic monitoring site in order to achieve its own yearly local bias factor.

APPENDICES



Appendix 1 – Sampling Locations in Armagh City. Mallview Terrace is at Location 6

Appendix 2: NO2 Automatic Analyser Data from AEA NETCEN

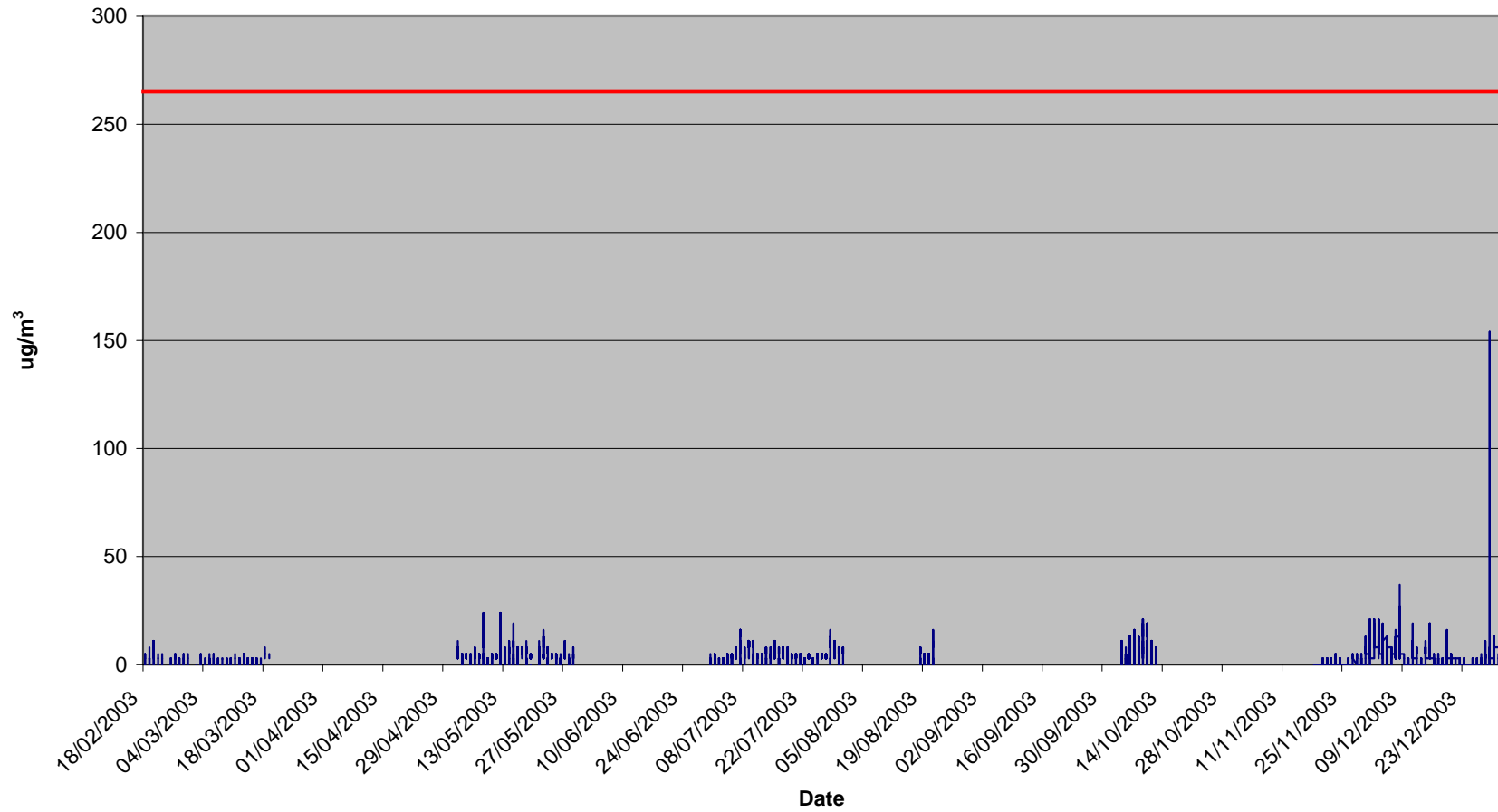
Average between two dates and times (GMT)											
Site name	Channel	Start date	Start time	End date	End time	Average	Number of records	Total concentration (units hours)	Data capture	Units	
Armagh Lonsdale Road	Nitrogen Dioxide	03/10/2006	12	31/10/2006	12	42	673	26741	95.5		
Armagh Lonsdale Road	Nitrogen Dioxide	31/10/2006	12	28/11/2006	12	-	673	-	0		
Armagh Lonsdale Road	Nitrogen Dioxide	28/11/2006	12	03/01/2007	12	29	865	20145	80	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	03/01/2007	12	31/01/2007	12	33	673	21865	99.6	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	31/01/2007	12	28/02/2007	12	37	673	23947	95.8	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	28/02/2007	12	04/04/2007	12	21	841	17260	99.3	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	04/04/2007	12	02/05/2007	12	29	673	19598	99.7	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	02/05/2007	12	30/05/2007	12	25	673	17094	99.7	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	30/05/2007	12	04/07/2007	12	23	841	18752	99	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	04/07/2007	12	01/08/2007	12	22	673	14468	99.9	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	01/08/2007	12	29/08/2007	12	26	673	17396	99.4	µg m-3 (20'C 1013mb)	
Armagh Lonsdale Road	Nitrogen Dioxide	29/08/2007	12	03/10/2007	12	31	841	26443	99.9	µg m-3 (20'C 1013mb)	
Average						28					
Average NO2 Diffusion Tube Result						38					
Average NO2 Analyser Result						28					
Average of Both (BIAS FACTOR)						0.74					

APPENDIX D

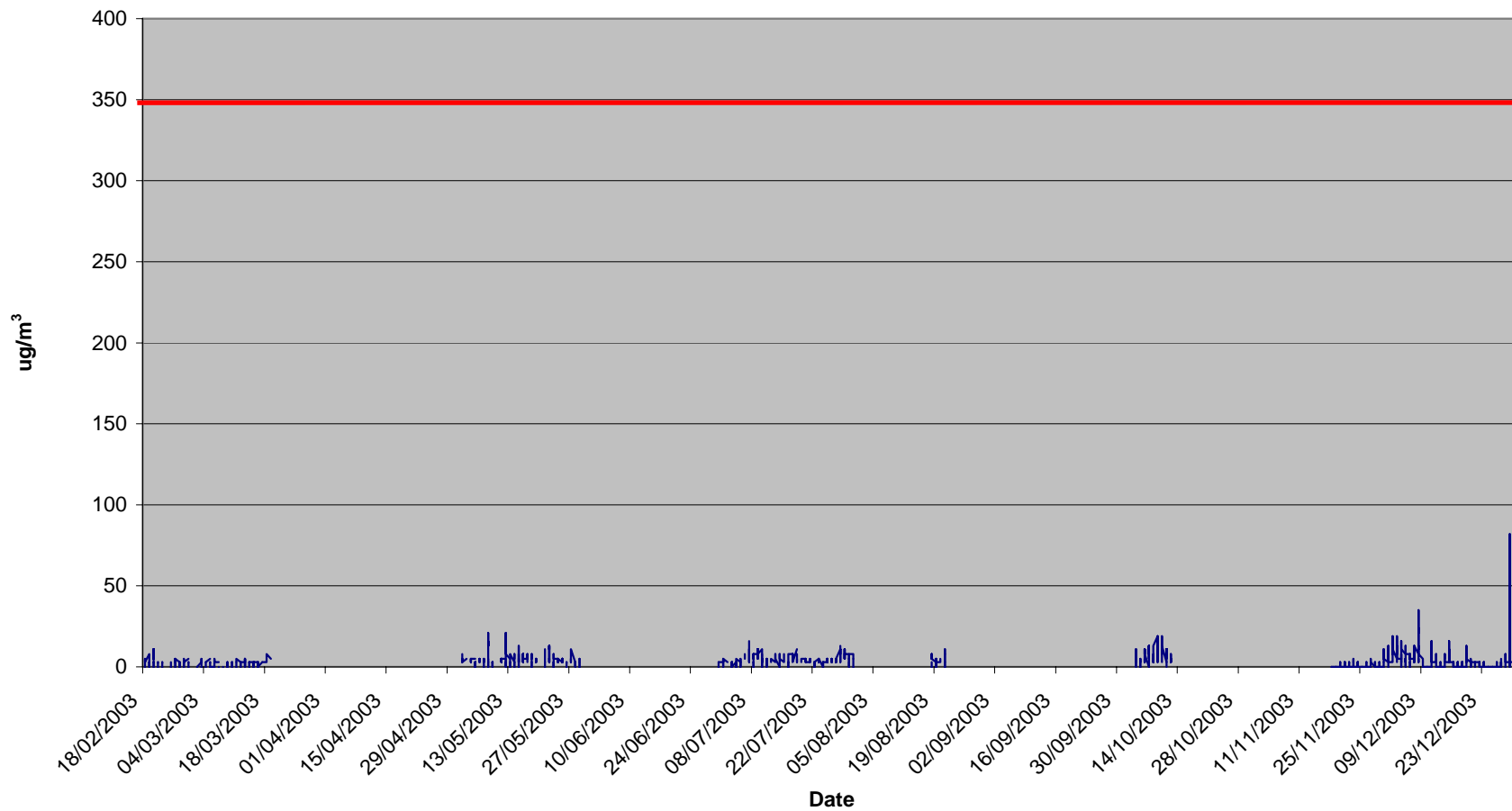
SO₂ Graphs

ARMAGH CITY & DISTRICT COUNCIL
2003 & 2004

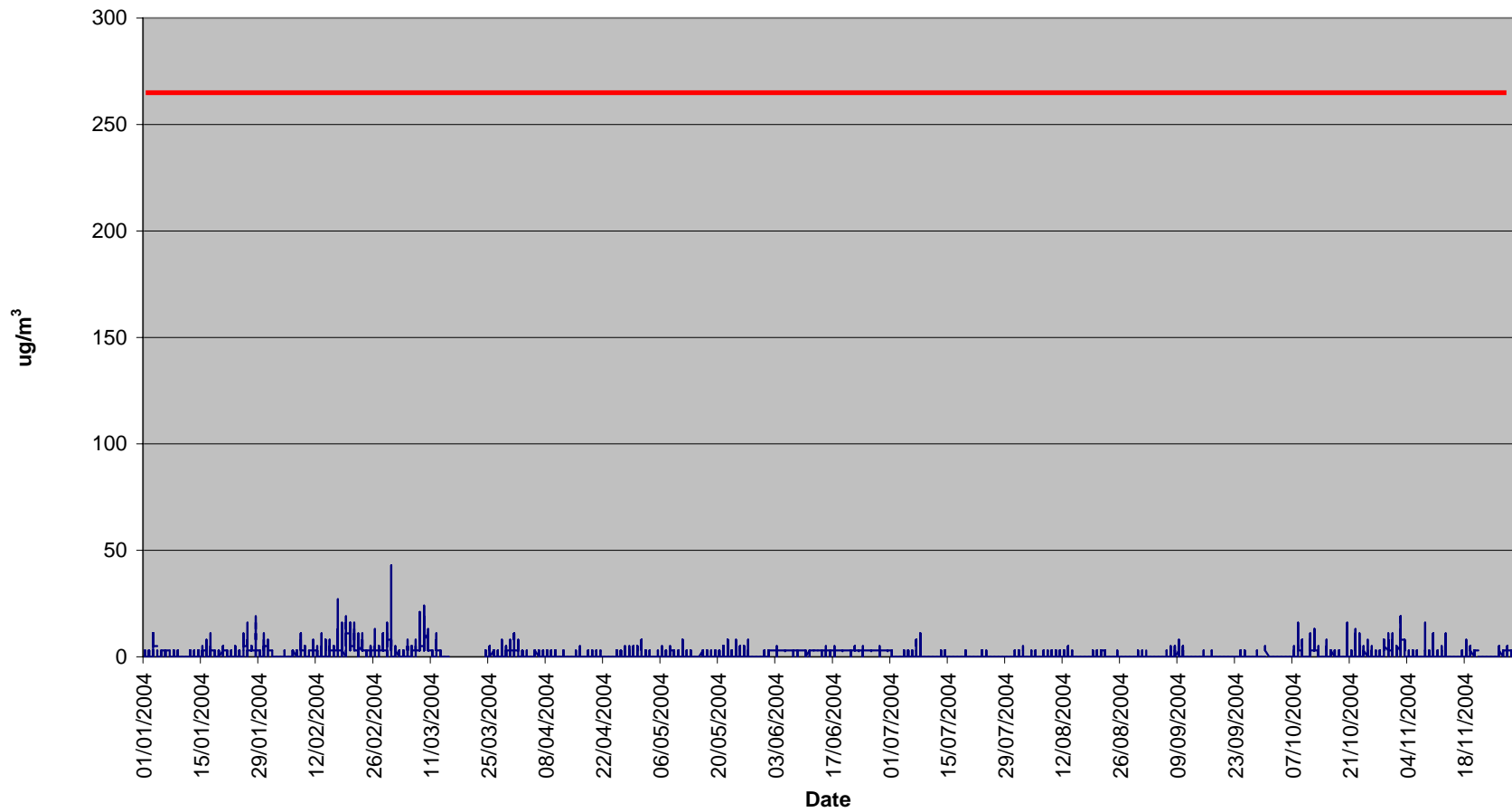
SO₂ 15min Mean Concentrations, Dobbin Street, Armagh 18th February to 31st December 2003



SO₂ Hourly Concentrations, Dobbin Street, Armagh 18th February to 31st December 2003



SO₂ 15min Mean Concentrations Dobbin Street, Armagh 1st January to 31st December 2004



SO₂ Hourly Concentrations, Dobbin Street, Armagh 1st January to 31st December 2004

