2009 Air Quality Updating and Screening Assessment for Ballymena Borough Council.

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

Date: April 2009

Local Authority Officer	Sinead Sargent Senior Environmental Health Officer

Department	Environmental Health Department
Address	Ballymena Borough Council Ardeevin 80 Galgorm Road Ballymena BT42 1AB
Telephone	028 2566 0431
e-mail	sinead.sargent@ballymena.gov.uk

Report Reference number	BBC/USA/0409
Date	April 2009

Executive Summary

The update screening and assessment findings are summarised as follows;

- **Conclusions from New Monitoring Data**

There are two significant conclusions from new monitoring data which support ongoing work since the last round of update and screening, these are;

1. Revocation of the Ballykeel and Dunclug AQMAs.

In October 2004 Ballymena Borough Council declared two Air Quality Management Areas broadly termed Ballykeel and Dunclug. Both AQMAs were designated in relation to likely exceedences of PM10 (annual and daily mean) objectives as specified by the air quality regulations. Source apportionment showed these exceedences were due to domestic coal burning.

The Air Quality Regulations state that PM_{10} gravimetric concentration as a daily average of 50µg/m^3 should not be exceeded more than 35 times per annum, in addition a target annual mean of 40µg/m^3 should be achieved. Local monitoring in 2008 has shown these objectives are being achieved even within the worst case contour for which the conversion to gas will not be completed until 2011. The major contributor to this improvement in air quality being that over 50% of NIHE housing stock has been converted to natural gas and there has been a positive impact even on this worst case contour. In addition it is hoped that fuel efficiency work undertaken by this department has also had a beneficiary impact, including owner occupiers availing of various grant aided schemes through sign posting by this department.

2. Declaration of an AQMA in the Linenhall / George Street Area.

A detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 µg/m^3. This is reflected in the nitrogen dioxide diffusion tube monitoring results.

- **Conclusions from Assessment of Sources**

The assessment of sources has not highlighted any new areas of concern.

- **Proposed Actions**

The Updating and Screening Assessment has not identified the need to proceed to a Detailed Assessment for any new pollutant. As discussed above a detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 µg/m^3. This report is currently with assessors for validation and approval to proceed with a declaration for an AQMA, as described above.

The Updating and Screening Assessment has not identified any need for additional monitoring, or changes to the existing monitoring programme mainly because there has been a continual review of same since 2006, in particular regarding domestic fuel burning and road traffic sources.

There are changes required to existing Ballykeel and Dunclug AQMAs by way of revocation. The air quality objectives within both areas are now being achieved due to substantial fuel conversion work undertaken by the NIHE since the declaration of these areas. This matter is with the devolved

administration for approval. It is not proposed to proceed to a Detailed Assessment based on the number of fuel burning sources that have been removed and local monitoring data.

Next course of action;

- To declare an AQMA along the Linenhall Street / George Street area (subject to approval) due to modelled nitrogen concentrations above the objective of 40 µg/m^3. Then to proceed with Action Planning as required.
- To revoke both Ballykeel and Dunclug AQMAs (subject to approval) as local monitoring has shown PM_{10} objectives are being achieved
- Submit 2010 Progress Report.

Table of contents

Appendices

Appendix A:	QA/QC information for diffusion tubes.
Appendix B:	The bias adjustment calculation spreadsheets
Appendix C	AQMA Orders
Appendix D	Quality Assurance/Quality Control for Automatic Continuous Analysers
Appendix E	Extract from WASP performance report.
Appendix F:	Letter to Devolved Administration seeking revocation of existing AQMAs.

1 Introduction

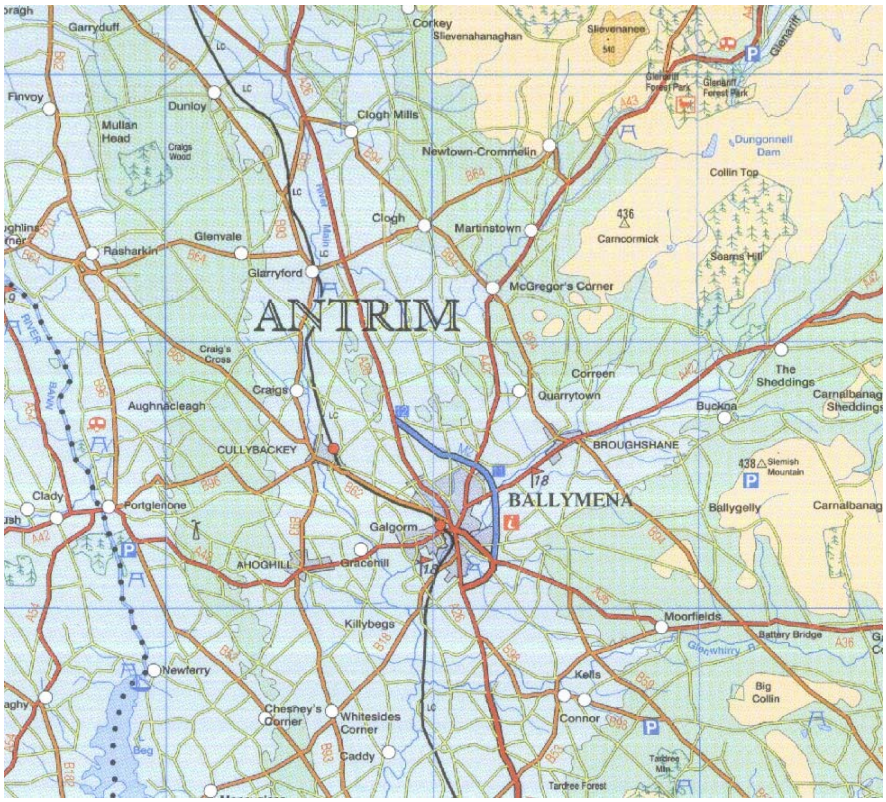
1.1 Description of Local Authority Area

Ballymena Borough has a population of approximately 60,000. The borough is approximately 200 square miles, of a mixed urban and rural character, located in the centre of a prosperous farming region. The Borough has a central location within Northern Ireland with good roads and rail communication network. It is served by the M2 motorway and with a station on the Belfast to Londonderry rail-line.

The International Airport itself is only 18 miles away and the Belfast City Airport is 30 miles from Ballymena. It is also accessible to the seaports of Larne and Belfast, 20 and 27 miles respectively.

The Antrim Coast and Giants Causeway bound it to the north, to the east by Slemish Mountain, to the west the river Bann, and to the south by Lough Neagh. The figure below illustrates the positioning of both Ballymena Town and the surrounding villages.

Figure 1.1 Showing the location of Ballymena Town and surrounding villages.



Local conditions that have a bearing on air quality include:

- Good transport infrastructure
- High levels of owner occupied housing/good quality housing
- Strong manufacturing base
- Above average reliance on agriculture, retail/distribution and public sectors in comparison to Northern Ireland overall.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM **in Northern Ireland** are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, and are shown in Figure 1.2. This table shows the objectives in units of microgrammes per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Figure 1.2 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Northern Ireland.

Pollutant	Air Quality Objective		Date to be achieved
	Concentration	Measured as	
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

First stage review and assessment (2000/01)

A First Stage Review and assessment of local air quality in Ballymena had highlighted the need to progress to second stage for:

- SO_2 and PM_{10} for domestic fuel burning
- PM_{10} and NO_2 for traffic data
- SO_2 from Two Industrial point sources, i.e. plant burning over 5 MW

Second stage review and assessment (2003/04)

A Second Stage Review and assessment concluded the following:

- NO_2 and PM_{10} from Road Traffic

Further DMRB modelling in February 2004 using 2002-04 monitoring data and 2003 road traffic counts confirmed that there was no need to declare an AQMA due to Road Traffic sources for either NO_2 or PM_{10} as these would not exceed objectives in 2004/05.

- SO_2 and PM_{10} from Domestic Fuel Burning

Commenced monitoring of SO_2 by means of Real Time Analyser in August 2002 within the worse case square, Ballykeel, in relation to domestic fuel combustion.

Relocation of two existing smoke and sulphur dioxide bubblers in 2002 to more appropriate locations within residential coal burning areas, namely Ballykeel and Dunclug.

Commenced monitoring of SO_2 by Diffusion Tubes in residential areas (10).

Modelling undertook in 2003/04 in respect of domestic fuel combustion for 6 areas of concern. This modelling concluded that an AQMA be declared in respect of PM_{10} for two areas of concern, broadly named Ballykeel and Dunclug. However further investigative work was required.

- SO_2 and PM_{10} from Industrial Point Sources

GSS Modelling for two industrial plants confirmed that SO_2 and PM_{10} objectives would not be exceeded in 2004.

Third stage review and assessment (2004)

The outcome of domestic fuel combustion modelling resulted in declaration of two AQMAs, broadly named Dunclug and Ballykeel, in respect of predicted exceedence on PM_{10}. Ballymena Borough Council proceeded to declare two AQMA's in respect of PM_{10} on 25th October 2004. A copy of the AQMA Order together with maps is shown in Appendix One.

The department's technical guidance stresses the importance of verifying the dispersion modelling by conducting local monitoring. Therefore a decision to co-locate a PM_{10} Real Time analyser with our existing SO_2 Real Time analyser within the Ballykeel AQMA was implemented in December 2004.

Stage Four Review and Assessment (2004/05).

With updated fuel use data obtained in late 2004 NETCEN were commissioned to conduct a Stage 4 Air Quality Review for domestic emissions sources within both AQMA'S. Importantly at this stage NIHE had embarked on a fuel conversion scheme with the Dunclug AQMA. Fresh data in respect of both areas was incorporated into the study. The report dated September 2005 assessed current and

potential future PM_{10} and SO_2 concentrations as a result of domestic fuel combustion emissions in two grids Ballykeel and Dunclug.

It should be noted that the modelling methodology used in the Stage 4 assessment differed from that used in the Stage 3 assessment. Until model verification with local monitoring data can be undertaken these model results are not finalised. This Stage 4 study represented a more accurate modelling exercise using more up to date information than the previous stage 3 modelling.

The conclusions of this report were:

- Particulate Matter (PM_{10} gravimetric)

Detailed modelling had shown that PM_{10} emissions arising from domestic fuel combustion in Ballymena Borough Council was predicted to cause an exceedence of the daily PM_{10} objective at relevant receptors within the assessed areas, specifically Ballykeel.

- Sulphur dioxide (SO_2)

Detailed modelling had shown that SO_2 emissions arising from domestic fuel combustion in Ballymena Borough Council were not predicted to cause an exceedence of the air quality objectives at relevant receptors within the assessed areas.

The modelling had predicted an exceedence of the regulated objectives. The designation of an AQMA remained valid subject to verification of the modelling using local monitoring data. Continuous monitoring of SO_2 was already in place to capture data for the purpose of verification and PM_{10} monitoring was introduced in December 2005.

The modelling had also predicted an exceedence of the provisional PM_{10} annual objective in 2010 in Ballykeel.

Update and Screening Assessment (April – June 2006)

The purpose of the update and screening assessment (USA) report was to reconsider all seven pollutants screened at first stage accounting for new or changed circumstances which may influence air quality. There are two key findings within the report:

Firstly, detailed assessment to particulate matter in relation to domestic coal burning within the two AQMA's should continue, with a verification study required as sufficient data was now available.

Secondly, in respect of nitrogen dioxide from traffic, a co-location study which was being undertaken using diffusion tubes and our real time analyser, indicated further investigative work is required regarding bias adjustment to diffusion tube data.

The conclusions of this report in respect of all pollutants were as follows;

Pollutant	Detailed Assessment Required
Carbon Monoxide	No
Benzene	No
1,3 Butadiene	No
Lead	No
Nitrogen Dioxide	No. Detailed assessment has been submitted. Diffusion tube co-location study remains under review.
Sulphur Dioxide	No
Particulate Matter	No

Ballymena Borough Council - Northern Ireland

Progress Report (2007)

The main sources of pollutants in the Ballymena Borough continued to be nitrogen dioxide from road traffic and sulphur dioxide / particulate matter from domestic sources. Nitrogen dioxide, sulphur dioxide and particulate matter continued to be monitored in key locations, with update to the department provided with reference to the objectives of relevance.

- Nitrogen Dioxide

The 2006 annual average concentrations for the passive nitrogen dioxide monitoring sites at Galgorm Road and Queen Street were above the Annual Mean Air Quality Objective of 40 μgm^{-3} with the application of a **local** (2.07) bias adjustment factor. In using the **national** (1.33) bias adjustment factor all sites remain below the 40 μgm^{-3} objective. In 2005 using a local bias adjustment (1.51), Galgorm Road was under the objective at 36.7 μgm^{-3}, however Queen Street was in exceedence of the objective at 45.7 μgm^{-3}. Importantly in 2005 using a national bias adjustment no site was in exceedence of this objective.

There was some doubt as to diffusion tube precision used during 2006. Efforts were made to address this issue, this included renewing our diffusion tube contract with an alternative service provider. The contract commenced 1st October 2007. It was proposed to review the matter at the earliest opportunity when sufficient diffusion tube data became available and provide an update within the next progress report due April 2008.

- Sulphur Dioxide and Particulate Matter (PM_{10})

The mean 2006 concentrations for both SO_2 and PM_{10} were below the annual air quality objectives for both these pollutants.

The Council relocated the Ballykeel AQMS to a best-fit location within the Ballykeel AQMA. Once sufficient monitoring data becomes available consideration will be given to the revocation of the Dunclug AQMA and either revocation / amendment of the Ballykeel AQMA.

Progress Report (2008).

The main sources of pollutants in the Ballymena Borough continued to be nitrogen dioxide from road traffic and sulphur dioxide / particulate matter from domestic sources. Nitrogen dioxide, sulphur dioxide and particulate matter continued to be monitored in key locations, with update to the department provided with reference to the objectives of relevance.

- Nitrogen Dioxide

In using the **national** (1.06 Lambeth) bias adjustment factor all sites remained below the 40 μgm^{-3} objective, however the Gradko bias adjusted (0.89) levels show Linenhall Street and George Street were in exceedence. Four other sites were close to the 40 μgm^{-3} objective. Of these six sites two were not considered relevant as there were no residential properties in these locations, i.e.

  - George Street
  - Ballymoney Street

For the other four sites it was this departments intention to undertaken further detailed assessment to determine whether declaration of an AQMA(s) was necessary

- Sulphur Dioxide and Particulate Matter (PM_{10})

The mean 2007 concentrations for both SO_2 and PM_{10} were below the annual air quality objectives for both these pollutants.

The Council had relocated the Ballykeel AQMS to a best-fit location within the Ballykeel AQMA and continued to monitor SO_2 and PM_{10} in this area. FDMS upgrade to the Ballykeel analyser was currently operating and once sufficient monitoring data comparable with that produced within the

DEFRA National Network became available consideration would be given to either revocation / amendment of the Ballykeel AQMA as required.

It was likely that in light of the re-verification modelling in relation to the 2006 Updating and Screening Assessment that the AQMA for Dunclug would be revoked in 2008.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are three continuous analysers currently in operation, at two locations. All sites were in operation at the last round of update and screening in 2006, however the Ballykeel analyser was relocated to a worst-case location in August 2007, following findings of a Stage 4 dispersion modelling report for domestic fuel combustion carried out by AEA. Additionally a FDMS was installed at the Ballykeel site, in 2007, in order to correct TEOM data. Details of monitoring are as follows:-

(1) Sulphur dioxide continuous analyser at Ballykeel
(2) Particulate matter (with FDMS) continuous analyser at Ballykeel
(3) Nitrogen dioxide continuous analyser at North Road

All continuous monitoring stations are part of the Calibration Club managed by AEA. Data from these sites are quality assured to the AURN standards as part of the Calibration Club. In addition a QA/QC audit which includes calibration of the analysers using zero and span gas standards, and other tests for efficiency is undertaken by AEA. Data are fully ratified by AEA staff using procedures as applied to data from the AURN UK national monitoring network sites.

Further information regarding Quality Assurance/Quality Control for Automatic Continuous Analysers is detailed in Appendix D.

Figure 2.1 Details of Automatic Monitoring Sites

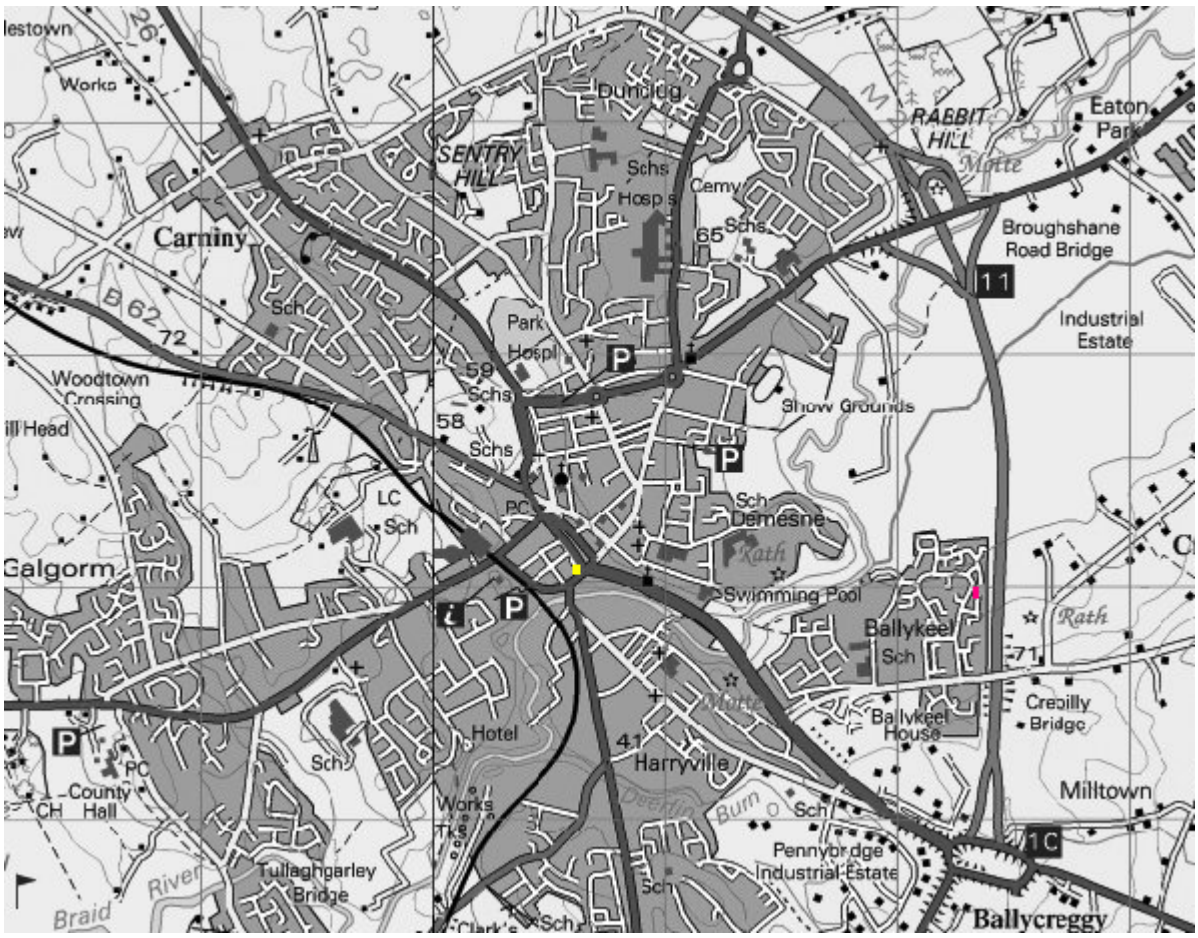
Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure?	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location ?
Ballykeel	AQMA	402 933 N 312 366 E	SO_2, PM_{10}	Y	Y	N/A	Y
North Road	Roadside	310 636 N 403 072 E	NO, NOx, NO_2	N	Y	2m	N*

*As preferred worst case location not an option due to a narrow footpath, the second preferred worst case location was chosen.

Figure 2.2 Showing photograph of Ballykeel Automatic Analyser

Figure 2.3 Showing photograph of North Road Automatic Analyser

Figure 2.4 Showing location map of Ballykeel and North Road Automatic Analysers



Ballykeel Site

North Road Site

2.1.2 Non-Automatic Monitoring

Ballymena Borough Council operates a network of nitrogen dioxide diffusion tubes across the borough. Suphur dioxide diffusion tube network and 'bubbler' monitoring for smoke and sulphur dioxide has ceased since the last USA round in 2006, as these methodologies are not suitable for use in LAQM (Para A1.52 of TG (09)).

The diffusion tubes are exposed for a four-week period. In 2007 the diffusion tubes were analysed by two different laboratories, from January to October by Lambeth Scientific Services Limited and from November 2007 until now by Gradko Services using 20% triethylamine in water. The locations of the diffusion tubes in the assessed areas are listed in Table 2.2 also shown in Figures 2.3. In addition, diffusion tubes were collocated with the North Road monitoring site (diffusion tubes 14a, 14b and 14c) in 2007and 2008. The location of the monitoring station also represents the location of the co-located diffusion tubes in Figure 2.3.

Table 2.2 Details of Non- Automatic Monitoring Sites – NOx Diffusion Tubes

Site No. & Name	Site Type	OS Grid Ref (Easting, Northing)	Pollutants Monitored	In AQMA?	Relevant Exposure?	Worst-case Location?
1. Leighinmohr Ave	UB	310220 402580	NO_x	N	Y	Y
2 Galgorm Rd	K	310335 403195	NO_x	N	Y	Y
3 Main St C'Backey	K	305730 405730	NO_x	N	Y	Y
4 Cullybackey Rd	K	310346 403442	NO_x	N	Y	Y
5 Larne St	K	310680 402850	NO_x	N	Y	Y
6 Ballyloughan Ave	UB	309530 404480	NO_x	N	Y	Y
7 George St	K	310591 403229	NO_x	N	Y	Y
8 Wellington St	K	310810 403420	NO_x	N	Y	Y
9 Ballymoney St	K	310800 403570	NO_x	N	Y	Y
10 Parkway	K	310900 403920	NO_x	N	Y	Y
11 Lisnevenagh Rd	R	311900 497010	NO_x	N	Y	Y
12 Queen St	K	310744 402213	NO_x	N	Y	Y
14a/b/c North Rd	R	310636 403072	NO_x	N	Y	Y
15 Linenhall St	K	310684 403121	NO_x	N	Y	Y

UB = urban background
K = kerbside
R = Roadside

Figure 2.3 Location Map showing NOx monitoring site locations.

Gradko laboratory precision and WASP scheme performance, in accordance Para 3.23 in TG (09) has been assessed as 'Good'. Confirmation of this performance is provided in Appendix E.

The laboratory bias correction factor was calculated using the ''diffusion tube'' spreadsheet tool and co-location study at North Road monitoring station. This diffusion tube spreadsheet tool is published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Executive and the Department of the Environment Northern Ireland and it is available on the UWE website (2008). A bias adjustment factor of 0.92 was calculated from this spreadsheet tool (http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310309.xls) , which used 11 studies from Gradko Services for 2008.

A local co-location study is carried out by exposing triplicate tubes at the location of the automatic station in North Road. A bias adjustment factor of 0.91 was calculated from the diffusion tubes co-located with the North Road site. This was done using the AEA Energy and Environments "Spreadsheet for calculating Precision, Accuracy and Bias Adjustment factors of Diffusion Tubes''. Both bias adjustment factors calculated from these two studies were applied to the raw diffusion tube data from the survey, for annual 2008 annual average at each location. This is shown in section 2.2.

2.2 Comparison of Monitoring Results with AQ Objectives

This section is presented pollutant by pollutant.

2.2.1 Nitrogen Dioxide

A detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 µg/m^3. This is reflected in the nitrogen dioxide diffusion tube results.

Automatic Monitoring Data

During the 2008 monitoring period there was no exceedences of the hourly, daily or the annual mean, as shown in the table below.

Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

BALLYMENA NORTH ROAD
01 January to 31 December 2008
This data has been fully ratified by AEA

POLLUTANT	NO_X	NO	NO_2
Number Very High	-	-	0
Number High	-	-	0
Number Moderate	-	-	0
Number Low	-	-	6567
Maximum 15-minute mean	1077 µg m^{-3}	540 µg m^{-3}	294 µg m^{-3}
Maximum hourly mean	768 µg m^{-3}	388 µg m^{-3}	176 µg m^{-3}
Maximum running 8-hour mean	417 µg m^{-3}	214 µg m^{-3}	107 µg m^{-3}
Maximum running 24-hour mean	288 µg m^{-3}	142 µg m^{-3}	81 µg m^{-3}
Maximum daily mean	288 µg m^{-3}	141 µg m^{-3}	73 µg m^{-3}
99.8th percentile of hourly means	-	-	120 µg m^{-3}
Average	56 µg m^{-3}	18 µg m^{-3}	29 µg m^{-3}
Data capture	74.8 %	74.8 %	74.8 %

All mass units are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2 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}	0	0

Diffusion Tube Monitoring Data

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site No. & Name	Site Type	Unadjusted annual mean*	Corrected with UWE bias adjustment figure		Corrected with local bias adjustment figure	
			Annual mean*	Scaled up to 2010*	Annual mean*	Scaled up to 2010*
1 Leighinmohr Ave	UB	11.6	10.4	9.3	10.6	9.5
2 Galgorm Rd	K	36.6	32.5	29.3	33.3	29.9
3 Main St C'Backey	K	25.2	22.5	20.2	23.0	20.7
4 Cullybackey Rd	K	31.2	27.8	25.0	28.4	25.6
5 Larne St	K	29.0	25.8	23.2	36.4	23.7
6 Ballyloughan Ave	UB	11.1	9.9	8.9	10.1	9.1
7 George St	K	**49.5**	**44.1**	39.7	**45.0**	**40.5**
8 Wellington St	K	30.0	26.7	24.0	27.3	24.5
9 Ballymoney St	K	31.0	27.6	24.8	28.2	25.4
10 Parkway	K	30.4	27.0	24.3	27.6	24.9
11 Lisnevenagh Rd	R	26.1	23.2	20.9	23.7	21.3
12 Queen St	K	39.0	34.7	31.2	35.5	31.9
14a/b/c North Rd	R	28.6	25.5	22.9	26.0	23.4
15 Linenhall St	K	**48.3**	**43.0**	38.7	**43.9**	39.5

*** indicates nitrogen dioxide concentration in µg/m^{-3}**

2.2.2 PM_{10} and Sulphur Dioxide

During the 2008 monitoring period there were no exceedences of the 15- minute, hourly or the annual means, as appropriate and as shown in the table below. Based on the 2008 data-set and action planning, council have written to the devolved administration seeking revocation of the Ballykeel and Dunclug AQMA's.

Table 2.5a Results of PM_{10} and Sulphur Dioxide Automatic Monitoring: Comparison with Annual Mean 15-minute, hourly and 24-hour Mean Objectives.

BALLYMENA BALLYKEEL
01 January to 31 December 2008

This data has been fully ratified by AEA

POLLUTANT	SO_2	PM_{10}*+
Number Very High	0	0
Number High	0	0
Number Moderate	0	37
Number Low	24087	5701
Maximum 15-minute mean	229 µg m^{-3}	1086 µg m^{-3}
Maximum hourly mean	77 µg m^{-3}	290 µg m^{-3}
Maximum running 8-hour mean	45 µg m^{-3}	129 µg m^{-3}
Maximum running 24-hour mean	29 µg m^{-3}	81 µg m^{-3}
Maximum daily mean	24 µg m^{-3}	77 µg m^{-3}
99.9th percentile of 15-minute means	101 µg m^{-3}	-
98th percentile of hourly means	-	83 µg m^{-3}
99.7th percentile of hourly means	53 µg m^{-3}	-
90th percentile of daily means	-	41 µg m^{-3}
Average	9 µg m^{-3}	25 µg m^{-3}
Data capture	69.3 %	65.4 %

FDMS TEOM from 24 September 2008
01 January to 23 September conventional TEOM with a factor of 1.3 applied to give Indicative Gravimetric Equivalent concentrations
All mass units are at 20'C and 1013mb

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	7	7
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	0	-

3 Road Traffic Sources

There are no locations that have not been assessed during the earlier rounds, nor where there has been a change or new development. Since the last USA round in 2006, Ballymena Borough Council have proceeded with a detailed assessment for nitrogen dioxide associated with road traffic. The detailed assessment report is currently with assessors. The recommendation is to declare an AQMA for the Linenhall Street/ George Street area. As part of this study road traffic counts were conducted in winter 2008. A number of hot spots were considered, all of which have nitrogen dioxide diffusion tubes at relevant receptors.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb.

There have been no new residential developments within 2m of the kerb, nor any granted planning approval for which development has not yet commenced. Extensive road traffic counts have been conducted since the last USA round in 2006, and no new areas of concern have been identified.

Ballymena Borough Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Diffusion tube monitoring continues in busy shopping areas within 5m from the kerbside, and annual mean does not exceed 60 µg/m^3 at any site. As part of the detailed assessment detailed information on traffic flows, speeds and vehicle proportion was obtained. No new busy streets have been identified.

Ballymena Borough Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

Traffic data obtained from counts in winter 2008, highest proportion of HGVs on previously identified worst case streets was 10%. No new roads were identified.

Ballymena Borough Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

Detailed assessment considered all relevant junctions. No new junctions requiring consideration have been identified.

Ballymena Borough Council confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

A26 Dualing project is proposed, however no formal planning application has been submitted to Planning Service. This department have been party to consultation and are in receipt of a 'Environmental Statement Scoping Report' dated March 2009 commissioned by DRD Road Service. Air Quality for both NO_2 and PM_{10} has been considered.

Ballymena Borough Council has assessed new/newly identified junctions meeting the criteria in Section A.5 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.6 Roads with Significantly Changed Traffic Flows

Ballymena Borough Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Information collated in 2006 regarding bus movements has not significantly changed. There is no station with 2500 bus / coach movements per day.

Ballymena Borough Council confirms that there are no relevant bus stations in the District.

4 Other Transport Sources

4.1 Airports

Ballymena Borough Council confirms that there are no airports in the District.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

There are no steam trains serving the district. There is no relevant exposure within 15m of stationary diesel trains, and no relevant lines within the borough as per table 5.1 of the technical guidance document. Further since 2006 there has been an upgrade with 'new' diesel trains servicing the borough.

Ballymena Borough Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

There are no relevant lines within the borough as per table 5.1 of the technical guidance document. In addition the annual mean is below 25 µg/m^3.

Ballymena Borough Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

Ballymena Borough Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

There are no new or proposed relevant installations for which planning permission has been granted either within the borough or within a neighbouring borough, since the last review and assessment round.

Ballymena Borough Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

There are no 'substantially increased' (30% or greater) relevant installations either within the borough or within a neighbouring borough, since the last review and assessment round. No new relevant exposure has been introduced.

Ballymena Borough Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

There are no new or significantly changed relevant installations either within the borough or within a neighbouring borough, since the last review and assessment round.

Ballymena Borough Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

Perusal of 2008 traffic data, relevant exposure from the pumps, consideration of stations with stage two vapour recovery and petroleum licence records has confirmed there are no petrol stations of concern.

Ballymena confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

Perusal of both IPPC public register and consideration of those poultry farms in the planning system does not identify any housing close to the relevant thresholds within box C.4.

Ballymena Borough Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

There are two plants currently subject to a planning approval, however applications are at the initial stages. In accordance with box 5.8 these proposed units are of insufficient size to require further consideration at future review and assessment rounds.

Ballymena Borough Council confirms that there are no biomass combustion plants in the District.

6.2 Biomass Combustion – Combined Impacts

Ballymena Borough Council confirms that there are no biomass combustion plant in the District.

6.3 Domestic Solid-Fuel Burning

With the arrival of natural gas to the borough since the last (2006) review and assessment round there has been significant reduction in coal burning within areas of concern, to the extent that it is proposed to revoke the existing AQMAs. A letter outlining reasons for is attached within Appendix F.

Ballymena Borough Council confirms that there are no areas of significant domestic fuel use in the District.

7 Fugitive or Uncontrolled Sources

Ballymena Borough Council confirms that there are no potential sources of fugitive particulate matter emissions in the District.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

There are two significant conclusions from new monitoring data which support ongoing work since the last round of update and screening, these are;

1. Revocation of the Ballykeel and Dunclug AQMAs.

In October 2004 Ballymena Borough Council declared two Air Quality Management Areas broadly termed Ballykeel and Dunclug. Both AQMAs were designated in relation to likely exceedences of PM_{10} (annual and daily mean) objectives as specified by the air quality regulations. Source apportionment showed these exceedences were due to domestic coal burning.

The Air Quality Regulations state that PM_{10} gravimetric concentration as a daily average of 50µg/m^3 should not be exceeded more than 35 times per annum, in addition a target annual mean of 40µg/m^3 should be achieved. Local monitoring has shown these objectives are being achieved even within the worst case contour for which the conversion to gas will not be completed until 2011. The major contributor to this improvement in air quality being that over 50% of NIHE housing stock has been converted to natural gas and there has been a positive impact even on this worst case contour. In addition it is hoped that fuel efficiency work undertaken by this department has also had a beneficiary impact, including owner occupiers availing of various grant aided schemes through sign posting by this department.

2. Declaration of an AQMA in the Linenhall / George Street Area.

A detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 µg/m^3. This is reflected in the nitrogen dioxide diffusion tube results.

8.2 Conclusions from Assessment of Sources

The assessment of sources has not highlighted any new areas of concern.

8.3 Proposed Actions

The Updating and Screening Assessment has not identified the need to proceed to a Detailed Assessment for any new pollutant. As discussed above a detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 µg/m^3. This report is currently with assessors for validation and approval to proceed with a declaration for an AQMA, as described above.

The Updating and Screening Assessment has not identified any need for additional monitoring, or changes to the existing monitoring programme mainly because there as been a continual review of same since 2006, in particular regarding domestic fuel burning and road traffic sources.

There are changes required to existing Ballykeel and Dunclug AQMAs by way of revocation. The air quality objectives within both areas are now being achieved due to substantial fuel conversion work undertaken by the NIHE since the declaration of these areas. This matter is with the devolved administration for approval. It is not proposed to proceed to a Detailed Assessment based on the number of fuel burning sources that have been removed and local monitoring data.

Next course of action;

- To declare an AQMA along the Linenhall Street / George Street area (subject to approval) due to modelled nitrogen concentrations above the objective of 40 µg/m^3. Then to proceed with Action Planning as required.
- To revoke both Ballykeel and Dunclug AQMAs (subject to approval) as local monitoring has shown PM_{10} objectives are being achieved
- Submit 2010 Progress Report.

9 References

- Local Air Quality Management Technical Guidance LAQM.TG (09), February 2009, DEFRA.
- Air Quality Review and Assessment – Detailed Assessment, March 2009, AEA Technology.
- A26 Dualling, Environmantal Statement, Scoping Report, March 2009, ARUP, Road Service.

Appendices

Appendix A:	QA/QC information for diffusion tubes.
Appendix B:	The bias adjustment calculation spreadsheets
Appendix C	AQMA Orders
Appendix D	Quality Assurance/Quality Control for Automatic Continuous Analysers
Appendix E	Extract from WASP performance report.
Appendix F:	Letter to Devolved Administration seeking revocation of existing AQMAs.

Appendix A: QA:QC Information for Diffusion Tubes

Diffusion Tube Bias Adjustment Factors

Gradko laboratory precision and WASP scheme performance, in accordance Para 3.23 in TG (09) has been assessed as 'Good'. Confirmation of this performance is provided in Appendix E.

The laboratory bias correction factor was calculated using the ''diffusion tube'' spreadsheet tool and co-location study at North Road monitoring station. This diffusion tube spreadsheet tool is published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Executive and the Department of the Environment Northern Ireland and it is available on the UWE website (2008). A bias adjustment factor of 0.92 was calculated from this - diffusion tube - spreadsheet tool (http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310309.xls) , which used 11 studies from Gradko Services for 2008.

A local co-location study is carried out by exposing triplicate tubes at the location of the automatic station in North Road. A bias adjustment factor of 0.91 was calculated from the diffusion tubes co-located with the North Road site. This was done using the AEA Energy and Environments "Spreadsheet for calculating Precision, Accuracy and Bias Adjustment factors of Diffusion Tubes''. Both bias adjustment factors calculated from these two studies were applied to the raw diffusion tube data from the survey, for annual 2008 annual average at each location.

Appendix B: The bias adjustment calculation spreadsheets.

The bias adjustment calculation, AEA spreadsheet is shown below;

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	02/11/2007	28/11/2007	26.6	25.7	24.3	26	1.2	5	2.9
2	28/11/2007	03/01/2008	41.7	44.0	39.8	42	2.1	5	5.3
3	03/01/2008	31/01/2008	37.3	38.4	40.9	39	1.8	5	4.6
4	31/01/2008	28/02/2008	38.6	35.3	40.5	38	2.6	7	6.5
5	28/02/2008	03/04/2008	22.5	23.3	25.8	24	1.7	7	4.3
6	03/04/2000	30/04/2000	25.6	10.5	20.0	20	3.7	18	9.1
7	30/04/2008	29/05/2008	34.5	23.7	28.8	29	5.4	19	13.4
8	29/05/2008	03/07/2008	23.1	23.2	23.3	23	0.1	0	0.2
9	03/07/2008	31/07/2008	21.0	20.9	21.8	21	0.5	2	1.2
10	31/07/2008	04/09/2008	27.1		27.5	27	0.3	1	2.4
11	04/09/2008	03/10/2008	22.9	21.5	20.9	22	1.0	5	2.5
12									
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
22	87.5	Good	Good
28	91.2	Good	Good
31	89.5	Good	Good
34	89.7	Good	Good
24	84.5	Good	Good
20	92.1	Good	Good
32	91.1	Good	Good
21	90	Good	Good
21	91.1	Good	Good
24	89.1	Good	Good
26	19.7	Good	or Data Capture
Overall survey -->		Good precision	Poor Overall DC

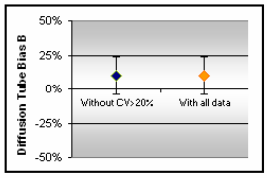
Site Name/ ID:

Precision: 11 out of 11 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

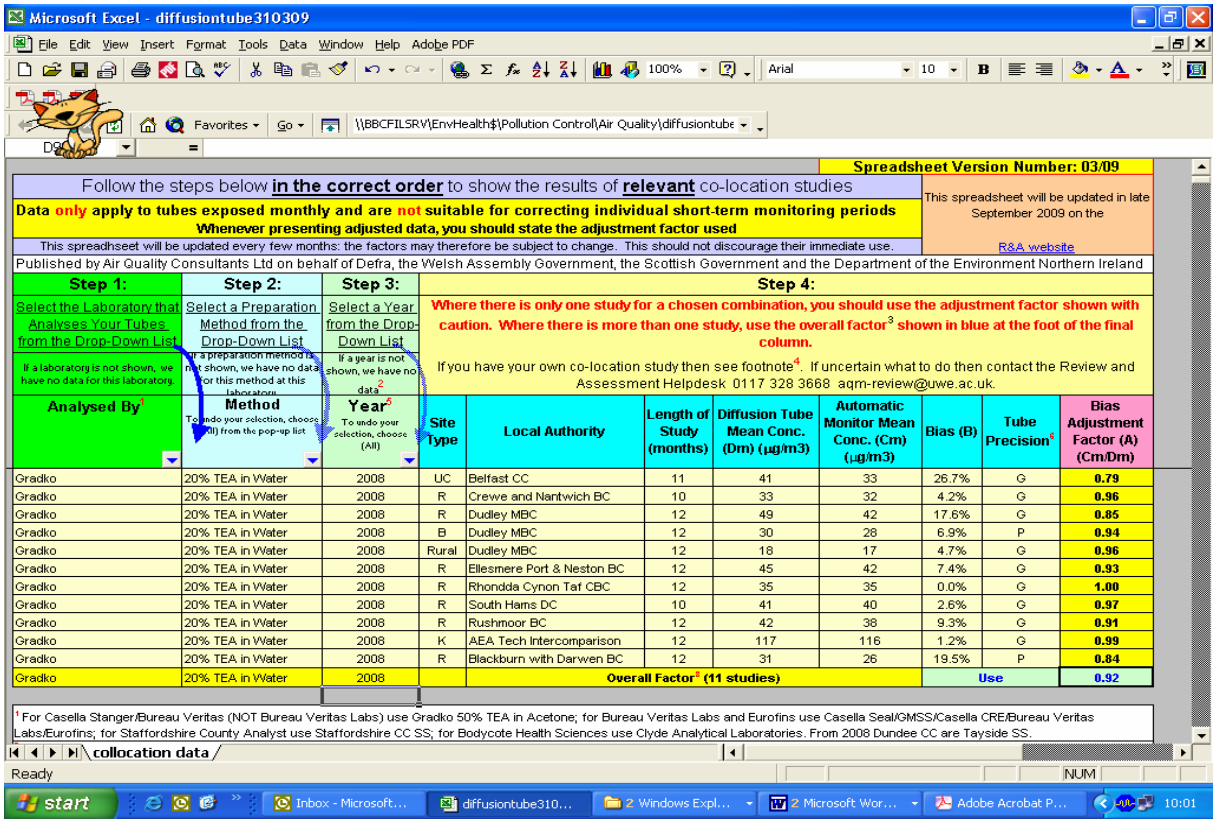
Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.91 (0.81 - 1.04)
Bias B	10% (-4% - 24%)
Diffusion Tubes Mean:	29 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	27 µgm^{-3}
Data Capture for periods used:	90%
Adjusted Tubes Mean:	27 (24 - 30) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	0.91 (0.81 - 1.04)
Bias B	10% (-4% - 24%)
Diffusion Tubes Mean:	29 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	27 µgm^{-3}
Data Capture for periods used:	90%
Adjusted Tubes Mean:	27 (24 - 30) µgm^{-3}



Jaume Targa
jaume.targa@aeat.co.uk
Version 03 - November 2006

The bias adjustment calculation, UWE spreadsheet is shown below;



Appendix C: AQMA Orders.

Air Quality Management Area Order No. 1

Environment (Northern Ireland) Order 2002, Part III, Article 12 (1)

Ballymena Borough Council, in exercise of the powers conferred upon it by Part III, Article 12 (1) of the Environment (Northern Ireland) Order 2002, hereby makes the following Order:-

1. This Order may be cited as the Ballymena Borough Council Air Quality Management Area Order No. 1 Ballykeel Area.

2. This Order and the Ballykeel Area Air Quality Management Area designated there under shall come into effect on 1st November 2004.

3. The areas shown on the map detailed in appendix one, outlined in black, are to be designated as an air quality management area for the Ballykeel area.

4. The Area to be designated as an Air Quality Management Area is displayed in map form and can be viewed by visiting the main council offices, 'Ardeevin' 80 Galgorm Road during the period from 2nd November 2004 to 29th December 2004. Further information is available by contacting staff of the Environmental Health Department on Tel 028 25 660 300.

5. The designated air quality management areas incorporate dwellings in the following housing estates:

Ballykeel AQMA

Dwellings in the Ballykeel 1, Ballykeel 2, Chichester Park Central, Chichester Park East and Chichester Park West estates together with certain houses on Crebilly Road, Larne Road, Meadowvale, Moat Road, River View and Knockeen Cresent.

A full list of incorporated streets or parts there of is contained in Appendix Two.

The Area is designated in relation to a likely breach of the Particulate Matter (PM_{10}) (annual and daily mean) objectives as specified in the Air Quality Regulations (Northern Ireland) 2003.

This Order shall remain in force until it is varied or revoked by a subsequent Order.

Given under the Corporate Seal of Ballymena Borough Council on the 1st day of November 2004.

Present when the Corporate Seal of the Ballymena Borough Council was affixed

hereto:-

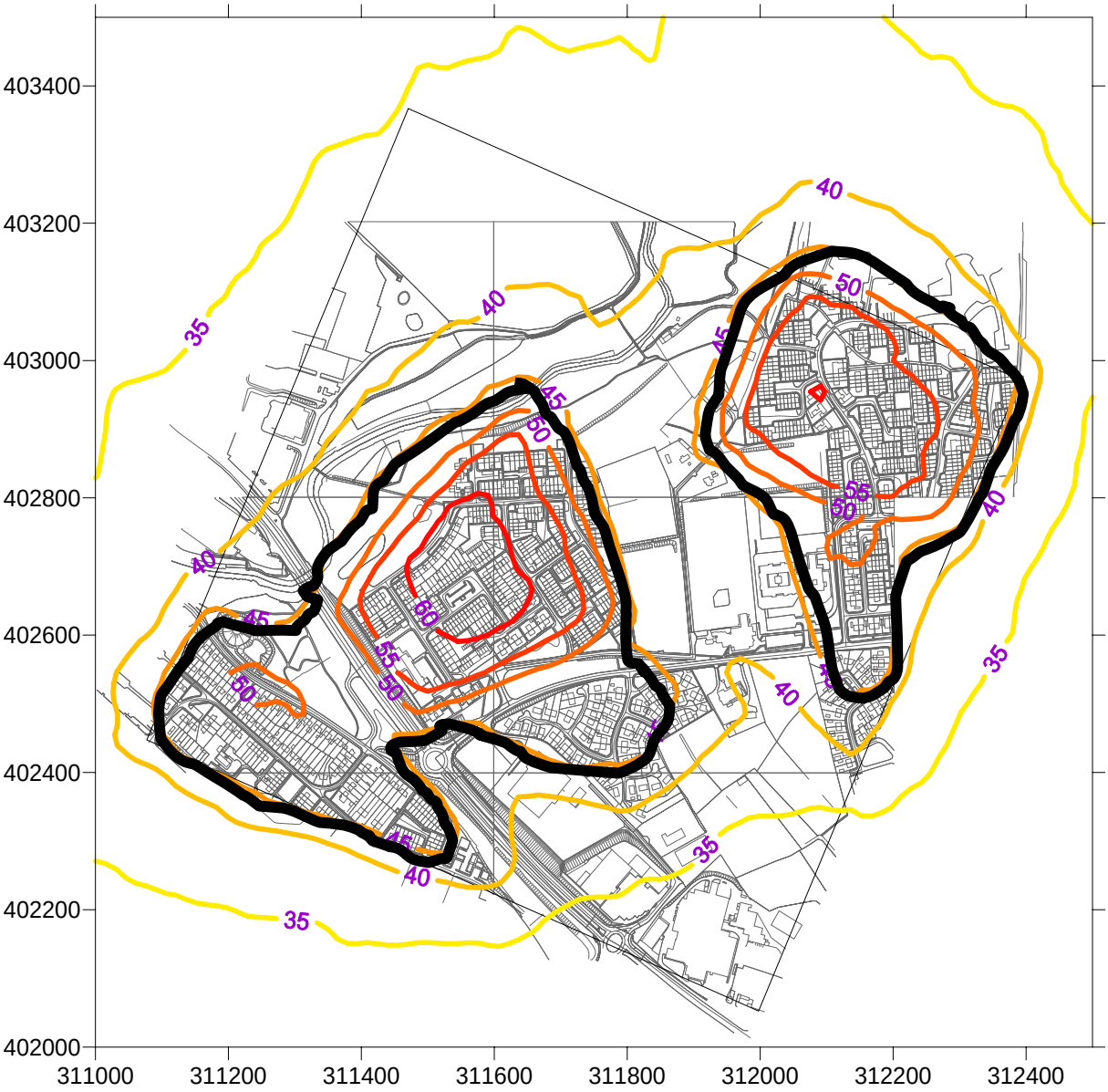
_____

Mayor
Councillor Hubert Nicholl

_____

Town Clerk and Chief Executive
Mervyn G Rankin

Air Quality Management Areas (AQMA) boundaries within Air Quality Management Area Order No.1.



Air Quality Management Area Order No.1 Ballykeel.

Appendix 2

Dwellings in the Ballykeel 1, Ballykeel 2, Chichester Park Central, Chichester Park East and Chichester Park West estates together with certain houses on Crebilly Road, Larne Road, Meadowvale, Moat Road, River View and Knockeen Cresent or Part there of.

Arran Avenue
Barra Drive
Chichester Park Central
Chichester Park East
Chichester Park West
Crebilly Road
Inchkeith Road
Incholm Avenue
Iona Gardens
Kintyre Park
Larne Road
Meadowvale
Moat Road
River View
Shona Green
Colonsay Park
Dalriada Walk
Knockeen Cresent
Knockeen Road
Lewis Park
Orkney Drive
Shetland Gardens
Shetland Park
Skye Park
Staffa Drive

Air Quality Management Area Order No. 2

Environment (Northern Ireland) Order 2002, Part III, Article 12 (1)

Ballymena Borough Council, in exercise of the powers conferred upon it by Part III, Article 12 (1) of the Environment (Northern Ireland) Order 2002, hereby makes the following Order:-

1. This Order may be cited as the Ballymena Borough Council Air Quality Management Area Order No. 2 Dunclug Area.

2. This Order and the Dunclug Area Air Quality Management Area designated there under shall come into effect on 1st November 2004.

3. The areas shown on the map detailed in appendix one, outlined in black, are to be designated as an air quality management area for the Dunclug area.

4. The Area to be designated as an Air Quality Management Area is displayed in map form and can be viewed by visiting the main council offices, 'Ardeevin' 80 Galgorm Road during the period from 2nd November 2004 to 29th December 2004. Further information is available by contacting staff of the Environmental Health Department on Tel 028 25 660 300.

4. The designated air quality management areas incorporate dwellings in the following housing estates:

Dunclug AQMA

Dwellings in the Dunclug Gardens, Dunclug Park, Dunvale, and Millfield estates together with certain houses within Blacksgrove, Cushendall Road, Doury Road, Garvey Wood, Grove Road, Johnston Close, Moorland Close and Parklands.

A full list of incorporated streets or parts thereof is contained in Appendix Two.

The Area is designated in relation to a likely breach of the Particulate Matter (PM_{10}) (annual and daily mean) objectives as specified in the Air Quality Regulations (Northern Ireland) 2003.

This Order shall remain in force until it is varied or revoked by a subsequent Order.

Given under the Corporate Seal of Ballymena Borough Council on the 1st day of November 2004.

Present when the Corporate Seal of the Ballymena Borough Council was affixed

hereto:-

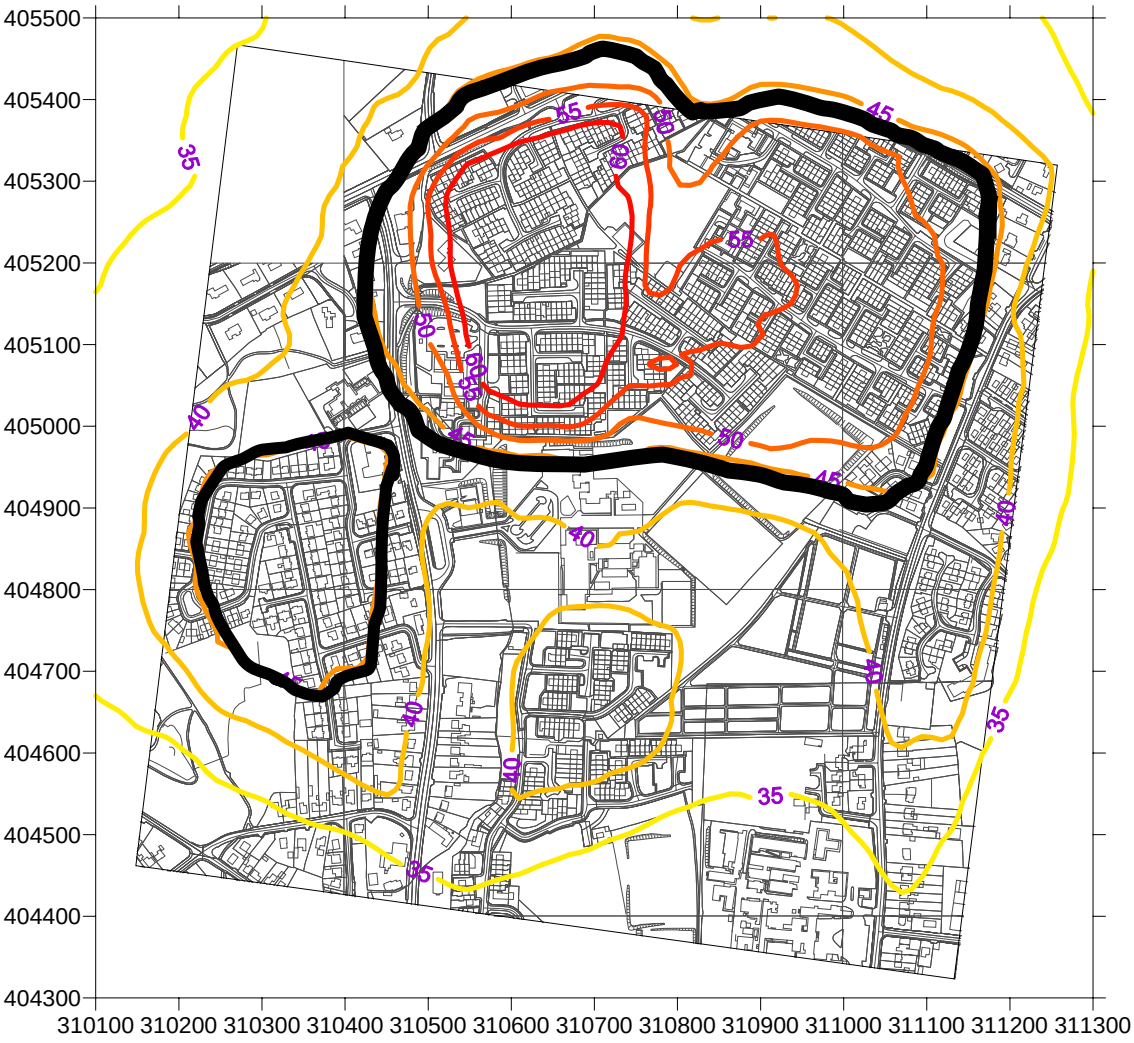
_____

Mayor
Councillor Hubert Nicholl

_____

Town Clerk and Chief Executive
Mervyn G Rankin

Air Quality Management Areas (AQMA) boundaries within Air Quality Management Area Order No.2.



Air Quality Management Area Order No.2 Dunclug.

Appendix Two

Dwellings in the Dunclug Gardens, Dunclug Park, Dunvale, and Millfield, estates together with certain houses within Blacksgrove, Cushendall Road, Doury Road, Garvey Wood, Grove Road, Johnston Close, Moorland Close, Murob Park, Rowallane Drive and Parklands or part there of.

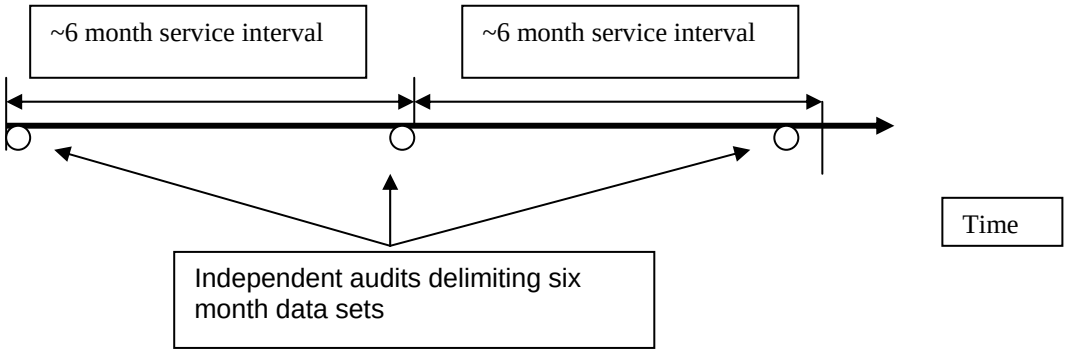
Alveston House
Blacksgrove
Brampton House
Cherrington House
Cushendall Road
Doury Road
Dunclug Gardens
Dunclug Park
Dunvale
Durleston House
Erlington House
Flaxton House
Garvey Wood
Grove Road
Johnston Close
Millfield
Mooreland Close
Murob Park
Parklands
Rowallane Drive

Appendix D: Quality Assurance/Quality Control for Automatic Continuous Analysers

The purpose of quality control audits is to rigorously test air pollution analysers in order to obtain an assessment of the analyser performance on the day of test. This information, in conjunction with the full analyser data set and additional calibration and service records, helps ensure data quality specifications are being met during the preceding data period. Additionally, six-monthly assessment of the station calibration cylinder concentration ensures that the cylinder concentration, used to scale ambient data, remains stable and thus suitable for scaling purposes.

In April 2007 Ballymena Borough Council commenced a 3 year QA/QC contract with AEA. During the three year contract period, the station will receive seven audits, one took place shortly after commencement of the contract and further scheduled six-monthly audits will be conducted to delimit the station data sets. To aid the data management process for the stations, all equipment support service schedules have been brought into line with the audit schedules as illustrated below:

Figure 13.4 showing support service schedule –v- site audits



Station Audits.

All station audits are undertaken using the procedures described in AEA's internal quality assurance document, Group Working Instruction AEAT/GW1/05/RAMP/43.01 and the audit results recorded on form AEAT/GF/05/RAMP/43.F1. This GWI and associated documents form AEA's extension to UKAS accreditation as Calibration Laboratory 0401 for field calibrations of air quality monitoring stations. AEA currently audits over 1000 air pollution analysers each year.

Analyser performance/parameters tested are:

- **Accuracy** – this is a measure of how closely the measurement system can estimate the concentration of a test sample compared to the "true value" of the concentration. The gaseous analysers are calibrated using UKAS accredited calibration standards and the resulting calibration factors are reported on the UKAS certificate of calibration.

- **Response Time** – this is the time taken for the system to respond to a step change in concentration at its inlet. Response time is defined as the time taken for the system to achieve 90% of its maximum value. Both rise and fall times are checked.

- **Site Calibration Standard Concentration Check** – Site calibration cylinders form the basis of the gaseous calibration systems at the stations and hence make scaling of data from the SO_2 and NOx analyser possible. It is therefore important to know the concentration of the gas mixture accurately. An assessment of the concentration of the on-site gas mixtures will be made – based upon the response to gas from the AEA audit transfer standard. This assessment will highlight if a calibration cylinder concentration is drifting and therefore requires replacing. These assessments are undertaken using audit calibration standards certified within AEA's own UKAS accredited calibration laboratory.

- **Linearity** – this is a measure of the relationship of analyser response with changing concentration. For conventional analysers, the relationship should be linear, i.e. twice the concentration will produce twice the output signal etc.

- **Noise Levels** – this is a measure of the change in system output when the pollutant concentration remains constant. Both zero noise, when the concentration is zero, and span noise, when the concentration is held at a particular value, are examined.

- **SO_2 Analyser Hydrocarbon Interference Test** – this test checks the efficiency of the hydrocarbon removal system used on the SO_2 analysers. The purpose of the hydrocarbon removal system is to ensure that hydrocarbon species do not interfere with the measurement of SO_2.

  As well as these tests, other assessments of the sampling and pneumatic systems are carried out. These include system leak checks, and, where possible, manifold pressure drop and flow rate measurements (useful to assess the residence time of sample gas within the manifold system, which should be minimised).

General Principles Adhered to During Station Audits

- Where practicable, test gases are introduced to the analysers via the sample lines that connect the analysers/instrument rack to the sampling manifold. This is to ensure that as much of the ambient sampling line as possible, including the sample inlet filter is tested.

- While analysers are under test, data should be flagged as audit data as opposed to ambient data. This will utilise the appropriate method for the stations (either "out of service" switches where fitted or by instruction to the data management unit for the stations). This will ensure that data during the audit is not disseminated as ambient data.

- A resettling period of 5 minutes is allowed after completion of the test before the "out of service" switch is reset to signal the collection of ambient data. This period allows the analysers to stabilise on ambient sampling.

- All analyser outputs (with the exception of particulate analyser tests) are taken from the relevant data collection system as un-scaled raw data.

- The pressure in all calibration gas cylinders is checked to ensure it is greater than 300 psi.

UKAS Certificate of Calibration

The output from each audit is in the form of a letter report outlining the results of each six-month audit and a UKAS Certificate of Calibration. The Certificate of Calibration provides a method by which the data management process for the respective stations can be checked (via comparison of the certificate calibration factors with those used to scale the station data). Where **AEA** undertake the stations data management, the letter report will be combined with the output from the stations data management process (described below).

The UKAS Certificate of Calibration provides the following information:

- The calibration and zero response factors for the analysers under test on the day of the audit.
- Uncertainties associated with the above values.

Data Management

The following sections describe the data management package that is provided under the Calibration Club. This includes data acquisition, validation and ratification of the inorganic and particulate pollutants measured by the two monitoring stations.

Ballymena Borough Council - Northern Ireland

The **AEA** data acquisition and management system consists of a central computer and telemetry facility that has been developed specifically for the UK's air quality monitoring programmes. Particular benefits of this system include:

- **Flexibility** – it can be easily modified to incorporate the measurement of new species, or the introduction of new data-logging or communications technology.
- **Efficiency** – the system is resident on the AEA Technology Computer Network, enabling a number of processing functions to be carried out rapidly and simultaneously.
- **Proven capability** – the system has been used to provide rapid high quality data from national monitoring programmes for many years.
- **Modular** – the system uses standard PCs and accessories. These can be simply replaced in the event of failure or run in parallel to boost performance.

The AEA system is housed within a specifically designed air-conditioned network control centre at AEA, Culham. All critical computer systems have uninterruptible power supplies installed to minimise downtime in the event of power cuts. AEA uses state of the art computer systems to automatically retrieve raw 15-minute (or hourly data depending of the station equipment) averaged measurements from monitoring stations on a daily basis.

A wide range of data management activities are routinely performed by AEA and these are integrated into the streamlined automatic data management system. Each day, measurement data is retrieved automatically from the monitoring stations (*data acquisition*). The data is then rapidly processed by applying the latest available calibration factors (*data scaling*) and carefully screened using specifically developed computer algorithms to identify suspect data or equipment faults (*data validation*). The provisional data is then appended to the site database (*data archiving*). These operations are carried out automatically by computer systems, with the output manually checked by AEA.

Once validated in this way, the previous day's results can be made available for dissemination to the respective Councils and other interested parties (as advised by the owning Council) on a daily basis via e-mail.

Data Acquisition and Processing

The monitoring site is polled daily to retrieve averaged raw output from station instruments. This data is transmitted via MODEM and automatically appended to the **AEA** air quality site database. The results of automatic overnight auto-calibration checks are also retrieved and data based.

Scaling factors, based on the most recent manual calibrations undertaken by this department are applied to the pollutant measurements to produce concentrations in the relevant units. The scaled data is stored as a separate database file the original raw data is retained at all times.

From the raw values, the hourly averaged results are then calculated. These are the averaging period used for the reporting of both validated and ratified data for all pollutants. Additionally 15-minute data files are provided for SO_2 to allow direct comparison with the legislative 15-minute objective.

Initial Validation of Data

To ensure high quality data is obtained with correspondingly high data capture rates, initial data screening is essential. AEA manually reviews data from the stations every day (in addition to their automatic software diagnostics) ensuring that problems are identified as soon as they occur.

All incoming data from the monitoring stations will be screened prior to the release of validated data sets. Experienced staff are on hand to investigate instances of suspect data.

- AEA has developed a number of specially developed algorithms for identifying flagging and editing suspect data.

The automatic screening procedures provide data of the highest quality and lead to the rapid diagnosis of any instrument malfunctions.

Should equipment or site problems be identified, it is possible for data management staff to contact the monitoring station by MODEM manually, in order to access further information. If necessary, this department will be contacted in order to invoke emergency call-out procedures for their equipment support unit.

Final Ratification of Data

A number of essential quality assurance/control details are collated in order to produce a final ratified data set every six months. These are as follows:

- Results of the routine instrument calibrations (undertaken by the relevant local authority)
- Instrument and site infrastructure service records
- Meteorological data (AEA receives daily met reports from the Met Office)
- Results of six-monthly station audits

At the end of each six monthly period, AEA uses this information for each of the stations, together with the following procedures, in order to formulate the final ratified data sets.

- A time series graph and calibration control chart of the validated data for the six months is plotted and reviewed.

- Data is automatically loaded one month at a time into the AEA data-handling package. This will enable 15-minute averaged raw data, scaled concentration data and calibration results to be examined. A site information database containing all comments entered as a result of call out visits or fault investigations, it also opened on screen.

- Concentration values will be deleted where appropriate e.g. during site visits or instrument failures. Raw data will however always be preserved.

- Some adjustments to the data may be necessary for a variety of reasons including:
    - Spikes in the processed zeros or scaling factors
    - Inconsistencies in the site calibrations
    - Inclusion of spurious auto-calibration data
    - Smoothing of calibration and zero drifts

- Daily zero or sensitivity factors may be modified to produce a smooth progression throughout the month, consistent with the auto-calibration response and/or manual calibrations.

- Site operation and data ratification notes are prepared for each instrument. These notes are used for discussion of data quality issues in the six-monthly report.

- Once all modifications to the monthly files have been made, time-series and calibration control charts for the entire six months are again plotted, annotated and examined.

- Following any final corrections, the ratified six-monthly data sets are available to this department.

Data Throughput Activity

A full table of operating tasks to be carried out by the project team is detailed below.

Ballymena Borough Council - Northern Ireland

Figure 13.5 showing operating tasks conducted by AEA

	Automated Systems	**Data Management**	**Project Manager**
Daily	Collect raw 15-minute averaged results Collect daily autocalibration results Apply calibration factors to calculate hourly averaged results Apply algorithms to screen data Database hourly results Collate provisional results for daily report	Investigate any suspicious data View previous 48 hours data & latest autocal and calibration factors Enter calibration results from routine and call out visits Send daily e-mail report	Contact Council to investigate instrument problems flagged by data manager
6-Monthly	List out files of RATIFIED results Calculate statistics	Ratify data Supply printouts of data on request Provide data analysis	Review site performance Write report to Council

Appendix E: Extract from WASP performance report.

WASP – Annual Performance Criteria for NO_2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 98-102.

Prepared by AEA on behalf of Defra and the Devolved Administrations.

Table 1 Laboratories that have demonstrated satisfactory performance in the WASP scheme for analysis of NO_2 diffusion tubes, July 2007 – July 2008.

Laboratory	Performance on basis of RPI, OLD CRITERIA, best 4 out of the 5 rounds 98 – 102	Performance on basis of RPI, NEW CRITERIA, best 4 out of the 5 rounds 98 – 102
Aberdeen Public Analysts	Good	Good
Bodycote Clyde Analytical	Good	Acceptable
Bristol City Council	Good	Good
Cardiff Scientific Services	Good	Good
Dundee City Council	Good	Acceptable
Edinburgh City Council	Good	Good
Glasgow Scientific Services	Good	Good
Gradko	Good	Good
Harwell Scientifics	Good	Good
Jesmond Dene Lab	Good	Acceptable
Kent Scientific Services	Good	Acceptable
Kirklees MBC	Good	Acceptable
Lambeth Scientific Services	Good	Acceptable
Milton Keynes Council	Acceptable	Acceptable
Northampton Borough Council	Good	Good
South Yorkshire Laboratories	Good	Good
Staffordshire County Council	Good	Acceptable
University of Essex	Good	Good
Walsall MBC	Good	Acceptable
West Yorks Analytical Services	Good	Good

For further information about any particular laboratory's performance, please contact the laboratory directly.

If you have any questions about these performance criteria, or the context in which they apply, please contact Alison Loader at AEA, on 0870 190 6518, or e-mail alison.loader@aeat.co.uk . For more general enquiries about the WASP scheme, please contact Hannah Clark at HSL, hannah.clark@hsl.gov.uk .

[1] The Health & Safety Laboratory: "WASP The Workplace Analysis Scheme for Proficiency - Information For Participants" Buxton, 2004.

Appendix F: Letter to Devolved Administration seeking revocation of existing AQMAs.

Dear Sir,

Re: The Environment (NI) Order 2002
The Air Quality Regulations (NI) 2003
Revocation of Ballykeel and Dunclug Air Quality Management Areas.

Further to a telephone conversation with and e-mail correspondence from Mrs Sinead Sargent, Senior Environmental Health Officer, regarding an updated action plan / revocation of both the Ballykeel and Dunclug AQMAs, I would confirm the following;

Technical Guidance document LAQM TG(09) states 'the devolved administrations expect that all decisions to revoke Air Quality Management Areas (AQMAs) should be subject to full consultation'. As such your comments would be valued on this department's opinion that subject to approval and ratification by council both Ballykeel and Dunclug AQMAs (for PM_{10} from domestic solid fuel burning) should be revoked. A history regarding declaration and a basis for revocation is provided below.

Declaration and action planning.

As you are aware in October 2004 Ballymena Borough Council declared two Air Quality Management Areas broadly termed Ballykeel and Dunclug. Both AQMAs were designated in relation to likely exceedences of PM_{10} (annual and daily mean) objectives as specified by the above air quality regulations. Source apportionment showed these exceedences were due to domestic coal burning.

In September 2005 a Stage 4 Domestic Fuel Combustion review and assessment was completed by AEA Technology (formerly NETCEN) on behalf of council. Importantly at this stage Northern Ireland Housing Executive (NIHE) had embarked on a fuel conversion scheme to oil within the Dunclug AQMA. Fresh fuel usage data in respect of both areas was incorporated into the study. The report assessed current and potential future PM_{10} and SO_2 concentrations as a result of domestic fuel combustion emissions in two grids, Ballykeel and Dunclug. In addition scenario modelling was considered within the report on the basis of future proposed programmed work by the NIHE within the Ballykeel AQMA.

This detailed modelling concluded that PM_{10} emissions arising from domestic fuel combustion were predicted to cause exceedence of the daily PM_{10} objective at relevant receptors within Ballykeel but not Dunclug, and that SO_2 emissions arising from domestic fuel combustion were not predicted to cause exceedence of the air quality objectives at relevant receptors within either of the assessed areas.

It is important to note that at the time of this 2005 study council monitored for SO_2 in Ballykeel and therefore pollutant verification of the model findings through local monitoring was possible, however no PM_{10} monitoring was undertaken. As such designation of an AQMA remained valid subject to verification of the modelling using local PM_{10} monitoring data. Continuous monitoring of PM_{10} was put in place in December 2005 to capture data for the purpose of verification.

Subsequent scenario modelling, in order to facilitate action planning, concluded that conversion of all 320 NIHE properties to gas / oil would result in pollution concentrations well below the PM_{10} objectives at relevant receptors within Ballykeel. In monitoring terms this was a predicted drop in the daily mean from 54 $\mu g/m^3$ to 26 $\mu g/m^3$, and 25 $\mu g/m^3$ to 14 $\mu g/m^3$ for 2010 annual mean concentrations at the worst location contour.

In October 2006 Ballymena Borough Council produced an Air Quality Action Plan which discussed measures to be implemented in pursuit of achieving air quality objectives and standards for pollutant of concern within the AQMA. This mainly focused on NIHE conversion scheme but also fuel efficiency / poverty work to be undertaken by Environmental Health staff within the AQMA targeting both NIHE tenants and owner occupiers.

In 2007 a full annual dataset to include sufficient winter data was made available, showing compliance with the relevant air quality objectives. However mindful that the monitoring site was not in the worst location contour (as identified by the modelling study), relocation of the analyser to within Ballykeel 2, together with TEOM gravimetric upgrade, was completed in August 2007.

Case for Revocation.

A full 2008 ratified dataset was received from AEA technology in May 2009. The data (see attached) concludes compliance with the air quality objectives for PM_{10} (and SO_2).

Technical Guidance document LAQM TG (09) paragraphs 1.40 – 1.43 consider the basis upon which an AQMA should be revoked or amended. It states 'the authority will therefore need to be able to demonstrate the same degree of confidence in its decision to revoke the AQMA, as was provided for the original declaration'. In addition 'the decision to revoke an AQMA should recognise that pollutant concentrations can vary significantly from one year to the next, due to the influence of meteorological conditions …. It is expected that local authorities will consider measurements carried out over several years … and local factors that may affect the AQMA including measures introduced as part of the action plan'.

The Air Quality Regulations state that PM_{10} gravimetric concentration as a daily average of 50 $\mu g/m^3$ should not be exceeded more than 35 times per annum, in addition a target annual mean of 40 $\mu g/m^3$ should be achieved. Local monitoring has shown these objectives are being achieved even within the worst case contour for which the conversion to gas will not be completed until 2011. The major contributor to this improvement in air quality has been that over 50% of NIHE housing stock has been converted to natural gas and there has been a positive impact even on this worst case contour. In addition it is hoped that fuel efficiency work undertaken by this department has also had a beneficial impact, including owner occupiers availing of various grant aided schemes through sign posting by this department.

It is therefore proposed that both the Ballykeel and Dunclug AQMAs are revoked. This would negate the need for an updated action plan as it is our opinion that air quality objectives are now being met. I trust you will make available your views on the content of this correspondence. Meantime should you wish to discuss the content of this correspondence further please do not hesitate to contact me on 028 25 660 380/375

Yours faithfully

A. A. Kinghorn
Director of Environmental Services.