Down District Council

2013 Air Quality Progress Report for Down District Council

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INVESTORS IN PEOPLE

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Executive Summary

Down District Council comprises a largely rural area of around 65,000 hectares in the south east of Northern Ireland, with a population of some 68,000. The main centres of population are located in Downpatrick, Newcastle and Ballynahinch. Agriculture and tourism form by far the most significant economic base in the area, with relatively little heavy industry

There have been no exceedences of the Air Quality Strategy objectives at relevant exposure within Down District Council area.

With respect to Nitrogen Dioxide, the 2010 Progress Report identified two exceedences of the Nitrogen Dioxide annual mean objective at diffusion tube roadside monitoring sites in Downpatrick i.e. Market Street and Church Street. A Detailed Assessment for NO_2 was submitted by Down District Council in 2010. As a result of this in July 2010 a real time analyser was installed in Market Sreet, in the prime location in accordance with the technical guidance. The results from this site in 2011 were below the objective and therefore no AQMA was declared. Monitoring continued at this site in 2012 along with diffusion tube monitoring in the surrounding area, results remain below the objective.

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1 Introduction

1.1 Description of Local Authority Area

The main centres of population are located in Downpatrick, Newcastle and Ballynahinch. Agriculture and tourism form by far the most significant economic base in the area, with relatively little heavy industry. The Irish Sea and the inlet to Strangford Lough form a natural boundary for the south and east of the District. Much of this boundary has Area of Special Scientific Interest (ASSI) status. To the south of the District are the Mourne Mountains which may form the centre of Northern Ireland's first National Park. The Ards and Down Area Plan prepared under Part III of the Planning (Northern Ireland) Order 1991 will have future impacts on air quality within Down District Council. The Council has five neighbouring council areas: Ards Borough Council; Castlereagh Borough Council; Lisburn Borough Council; Banbridge District Council and Newry and Mourne District Council.

1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

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 Table 1.1. This table shows the objectives in units of micrograms 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).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Northern Ireland.

Pollutant	Concentration	Measured as	Date to be achieved by
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 (PM10) (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

Down District Council has completed the following reviews and assessments of air quality in earlier rounds of the assessment process:

Stage 1 Report (DDC, 2000)	The first stage assessment identified all significant pollutant sources with Down District Council area. The air quality objectives were unlikely to be exceeded and no detailed assessment was necessary.
Stage 2/3 Air quality review (DDC, 2003)	The conclusions of this review stated that there was no need to progress to the third stage review and assessment and that no Air Quality Management Areas (AQMA'S) needed to be declared.
Progress report (DDC, 2005)	The progress report concluded that NO_2, SO_2 and PM_{10} were not predicted to cause exceedances of the air quality objectives at relevant receptors.
Updating and Screening Assessment (DDC, 2006)	The USA was carried out according to Local Air Quality Management Policy Guidance LAQM.TG(03). The assessment looked at seven pollutants and no detailed assessments were required. No AQMA's were required in Down District Council and there was no need for a detailed assessment in 2007.
Progress Report (EG, 2008)	Diffusion tube monitoring indicated that the annual average objective for NO_2 was being exceeded at the Irish street location in Downpatrick. Down DC Officers evaluated sites with a view to installing real time monitoring equipment. There are currently no Air Quality Management Areas (AQMA'S) within the Down District Council area. Diffusion tube measurements made in the Irish Street area during 2007 and 2008 indicated exceedances in relation to NO_2. A detailed assessment involving additional diffusion tubes was commenced in late 2008 at this Irish Street location.
Updating and Screening Assessment (DDC, 2009)	The main conclusion from the 2009 Updating and Screening Assessment (USA) was that diffusion tube measurements at Irish Street junction, Downpatrick indicated exceedances of the annual mean objective for nitrogen dioxide in both 2007 and 2008. There is relevant exposure at this location. The measurement of nitrogen

	dioxide at the remaining monitoring sites has shown no exceedances of air quality objectives. Down District Council then undertook a Detailed Assessment for NO_2 in the vicinity of Irish Street.
Detailed Assessment 2010	For the purposes of this Detailed Assessment additional NO_2 diffusion tubes were placed along Market Street, Irish Street, English Street and Church Street, Downpatrick. These additional tubes were installed in October 2008 and a full year of monitoring has now occurred. Following a bias adjustment of the diffusion tube results it was found that the tubes at Down 1(Irish Street location) Down 11 (Church Street) and Down 13 (Market Street) exceeded the air quality limit of 40ug/m^3 for Nitrogen Dioxide. Down District Council have committed to installing a real time analyser on Market Street junction, Downpatrick, as local authorities are advised not to rely upon diffusion tube data alone to declare an Air Quality Management Area (A1.42 LAQM Technical Guidance LAQM .TG(09)). It is expected that this equipment will be operational at the beginning of June 2010 and the results obtained over the following six month period will influence Down District Council in declaring an Air Quality Management Area (AQMA). Down District Council are still awaiting acceptance of this Detailed Assessment by DOE.
Progress report (DDC, 2010)	Diffusion tube monitoring indicated that the annual average objective for NO_2 continued to exceed the objective at the Irish street location in Downpatrick, and that the intention was to install an automatic station at this site in June 2010 at relevant exposure.
Progress report (DDC, 2011)	This reported the continued monitoring of NO_2 and the conclusions from the new data from a realtime analyser installed in Market Street
Updating and Screening Assessment (DDC, 2012)	The 2012 Updating and Screening Assessment (USA) reported results from the monitoring of NO2 in Downpatrick and Newcastle. Results remained below the objective in 2011 and reported the intention to continue monitoring in 2012.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

NO_2 diffusion tubes sited at the junction of Church Street, Irish Street and Market Street, had shown levels of NO2 to be above the objective. These were replaced in June 2010 with an automatic station monitoring NO_2 real time data using Chemiluminescence technique. The site is positioned to give the worst case scenario at relevant exposure. Since monitoring commenced at this site results have remained below the objective.

See Appendix A: Details of Quality Assurance and Quality Control

Figure 2.1 Map(s) of Automatic Monitoring Sites

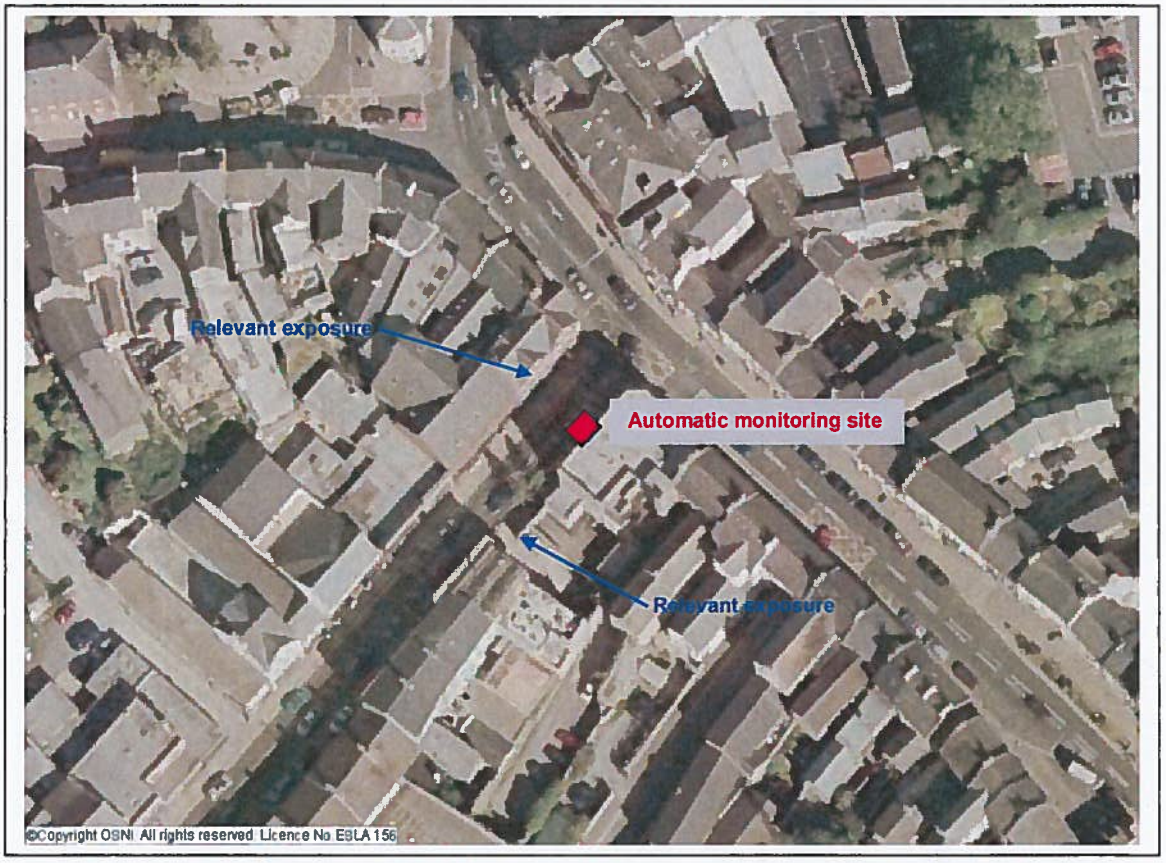


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQ MA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Market Street Downpatrick	Roadside	348655	344596	NO_2	Chemiluminescence	NO	YES 10M	1.5M	YES

2.1.2 Non-Automatic Monitoring

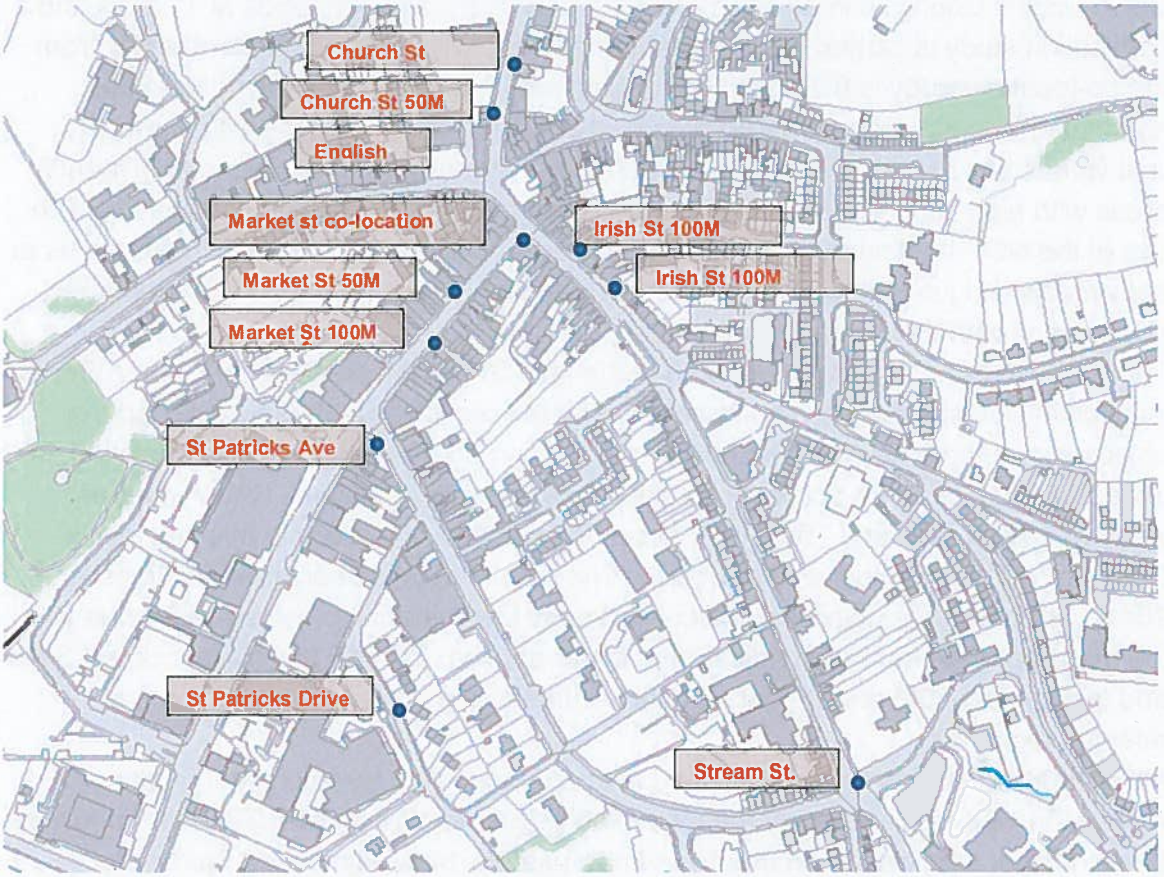
Down District Council carries out monitoring of NO_2 by diffusion tubes at 11 sites and a co-location study is carried out at the automatic site. The bias adjustment factor from the co-location study is **0.76**.and the results from this have been included in the national data base. Diffusion tube data cannot be compared directly with air quality limit values based on short-term averages; however, they can be used to help identify areas with high concentrations of NO_2, which require more detailed investigation. The aim of the NO_2 monitoring undertaken has been to measure pollutant concentrations at busy roads and junctions especially near residential areas. The tubes are sited in accordance with the technical guidance LAQM.TG(09)

Triplicate diffusion tubes were located at the Irish Street /Market Street / Church Street junction in Downpatrick for a number of years, the results from these exceeded the objective and therefore were removed in 2010 and an automatic site was installed in June 2010 to gain more accurate results at this location. Additional diffusion tubes were located at 50M and 100M intervals along the streets leading to this junction in October 2008 to gain further information. The results at these sensitive locations in 2011 were below the objective and considerably lower than in previous years due to the more accurate local bias adjustment factor applied. In 2012 the Market Street 50M and Irish Street 50M are the only location with elevated levels, these are not at relevant exposure.

All the diffusion tubes have been sited in accordance with the technical guidance.

A decision was made to apply the local bias adjustment factor of **0.76** to the diffusion tubes, further information on the decision to use this bias adjustment factor and details of the QA/QC of the diffusion tubes can be found in appendix A

Figure 2.2 Map(s) of Non-Automatic Monitoring Sites



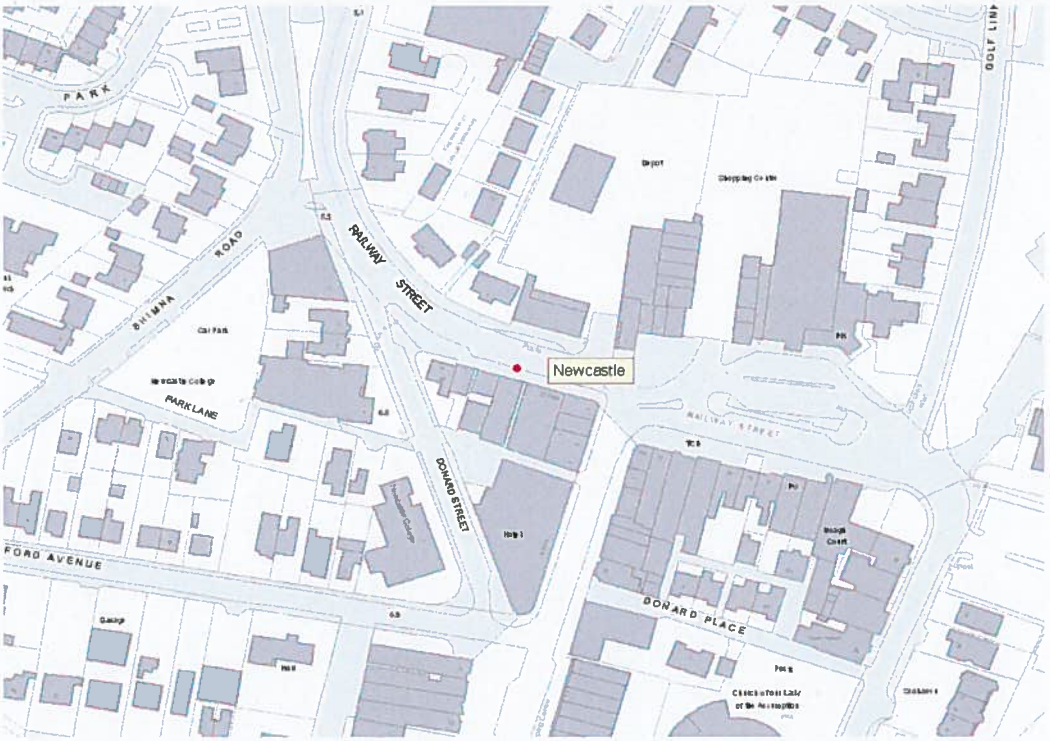


Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Market Street Junction	Roadside	348655	344596	NO_2	N	Y	6M	1.5M	Y
Irish Street 50M	Roadside	348702	344609	NO_2	N	N	3M	1M	Y
Irish Street 100M	Roadside	348735	344566	NO_2	N	N	10M	1M	Y
Church Street 50M	Roadside	348422	344646	NO_2	N	N	12M	1M	Y
Church Street 100M	Roadside	348664	344744	NO_2	N	N	12M	1M	Y
Market Street 50M	Roadside	348686	344509	NO_2	N	N	10M	1M	Y
Market Street 100M	Roadside	348598	344531	NO_2	N	N	10M	1M	Y
St. Patricks Ave	Roadside	348542	344448	NO_2	N	N	20M	1M	Y
English Street	Roadside	348605	344664	NO_2	N	N	10M	6M	Y
Stream Street	Roadside	348915	344207	NO_2	N	N	10M	1M	Y
St Patricks Drive	Background	348605	344205	NO_2	N	N	10M	1M	N
Newcastle	Roadside	337818	331601	NO_2	N	N	15M	0.5M	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

In the following section results are presented for NO_2 at the automatic and diffusion tube sites and compared with the objective. The Market Street and Irish Street 50M sites are elevated in 2012 but these are not at relevant exposure.

Automatic Monitoring results

Table 2.3a presents the annual mean concentrations of NO_2 determined at the automatic site in 2012 from the hourly measurements. Results are very slightly raised each year but this is more likely to be as a result of climatic conditions rather than changes in emissions.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

As there has only been just over 2 years of data available from the automatic analyser no trend is visible.

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %[a]	Valid Data Capture 2011 % [b]	Annual Mean Concentration μg/m^3				
					2008	2009	2010	2011	2012
Market Street	Roadside	N	93.9	93.9			35.36(a)	36	38

[a] Only six months data was available in 2010 and therefore the annual mean has been annualised in accordance with the technical guidance.

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %[a]	Valid Data Capture 2011 % [b]	Number of Exceedences of Hourly Mean (200 μg/m^3)				
					2008	2009	2010	2011	2012
Market Street	Roadside	N	93.9%	93.9%			0	0	0

Diffusion Tube Monitoring Data

There are presently 11 diffusion tube monitoring locations in Down District Council. Irish Street junction site has now been replaced with an automatic analyser. Market Street, Irish Street and English Street all leading into this junction have tubes positioned 50 metres and 100 metres from this sensitive receptor since 2009 to determine the levels of NO_2 further along these incoming roads. These tubes are not at relevant exposure.
The local bias adjustment factor of **0.76** has been applied to the 2012 results.
Results of the NO_2 diffusion tube sites are shown below in table 2.5
They are sited in accordance with the technical guidance.LAQM.TG(09)
Details of the QA/QC for the diffusion tubes and the reason for the use of the bias adjustment factor **0.76** can be found in appendix A

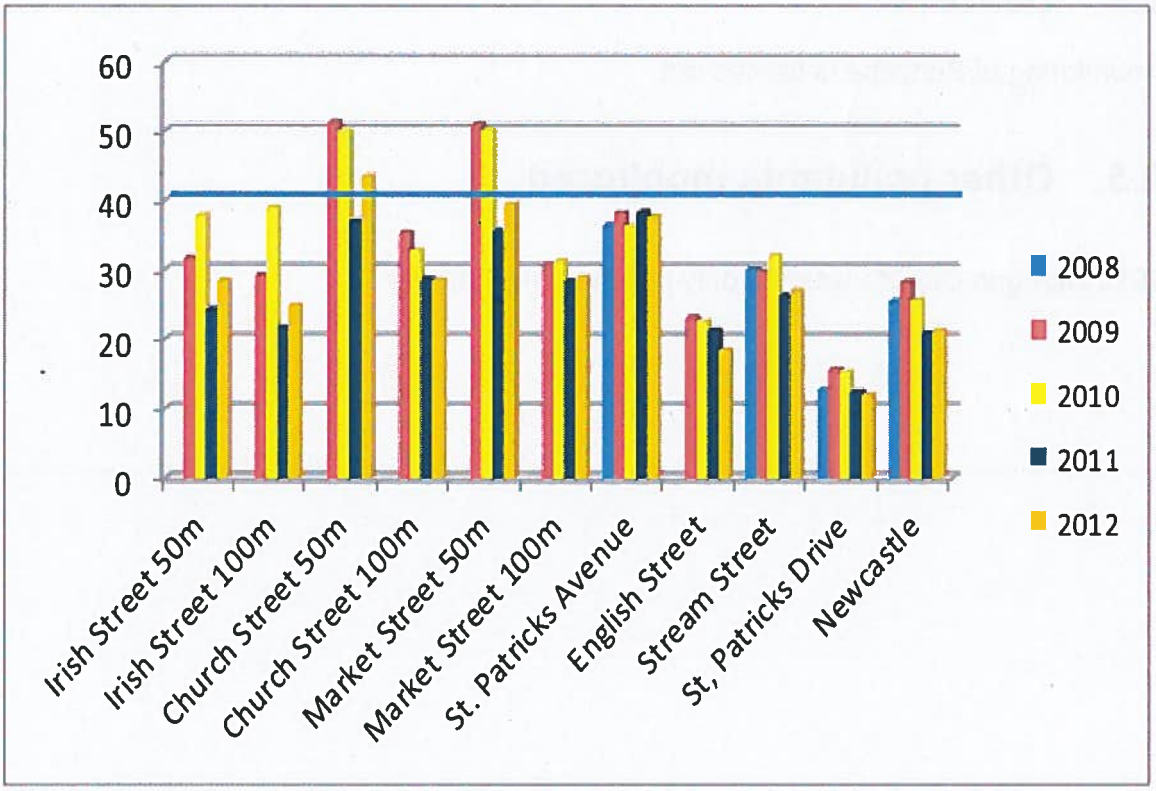
Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months [a]	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.76 [b]
Irish Street 50M	Irish Street	Roadside	N	N	12 Months	29
Irish Street 100M	Irish Street	Roadside	N	N	12 Months	25
Church Street 50M	Church Street	Roadside	N	N	12 Months	**43**
Church Street 100M	Church Street	Roadside	N	N	12 Months	29
Market Street 50M	Market Street	Roadside	N	N	11 Months	**40**
Market Street 100M	Market Street	Roadside	N	N	9 Months	29
St. Patricks Ave	St. Patricks Ave	Roadside	N	N	10 Months	38
English Street	English Street	Roadside	N	N	12 Months	18
Stream Street	Stream Street	Roadside	N	N	12 Months	27
St Patricks Drive	St Patricks Drive	Background	N	N	12 Months	12
Newcastle	Newcastle	Roadside	N	N	12 Months	21

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
			2008* (Bias Adjustment Factor =0.83)	2009* (Bias Adjustment Factor =0.81)	2010* (Bias Adjustment Factor =0.84)	2011 (Bias Adjustment Factor =0.72)	2012 (Bias Adjustment Factor =0.76)
Irish Street 50M	Roadside	N	N/A	32	38	24	29
Irish Street 100M	Roadside	N	N/A	29	39	22	25
Church Street 50M	Roadside	N	N/A	51	50	37	**43**
Church Street 100M	Roadside	N	N/A	35	33	29	29
Market Street 50M	Roadside	N	N/A	51	50	36	**40**
Market Street 100M	Roadside	N	N/A	31	31	28	29
St. Patricks Ave	Roadside	N	36	38	36	38	38
English Street	Roadside	N	N/A	23	23	21	18
Stream Street	Roadside	N	30	30	32	26	27
St Patricks Drive	Background	N	13	16	15	12	12
Newcastle	Roadside	N	25	28	26	21	21

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.

Levels have remained consistent at all sites, in 2011 there is a noticeable reduction this is due to a more accurate new local bias adjustment factor applied. A very slight increase in 2012 was more likely to be as a result of climatic conditions rather than changes in emissions.



2.2.2 PM_{10}

Down District Council does not carry out monitoring for PM_{10} pollution at this time.

2.2.3 Sulphur Dioxide

Down District Council did not carry out any monitoring of SO2 in 2012

2.2.4 Benzene

No monitoring of Benzene is carried out.

2.2.5 Other pollutants monitored

In 2012 Nitrogen Dioxide was the only pollutant monitored

2.2.6 Summary of Compliance with AQS Objectives

Down District Council has examined the results from monitoring in the Council area. Concentrations are all below the objectives at relevant exposure; therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

Down District Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

Down District Council confirms that all the following have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

4 Conclusions and Proposed Actions

4.1 Conclusions from New Monitoring Data

The 2012 monitored data for NO2 has been assessed and has indicated no exceedences of the national air quality objectives at relevant exposure.
There were no other exceedences identified

4.2 Conclusions relating to New Local Developments

Down District Council has found no new or significant new developments to have likely impacts on air quality.

4.3 Proposed Actions

This 2013 progress report for Down District Council has identified there is no need to proceed to a detailed assessment for any of the pollutants.
Down District Council will continue monitoring NO_2 in 2013 at the automatic site were levels remain close to the objective. This site is sited in accordance with the guidance in a prime location and at relevant exposure, however the NO2 diffusion tube monitoring will cease in Down District in 2013 as there is now enough historic information, and these sites are not at relevant exposure. If the results from the automatic site remain below the objective in 2013 Down District Council intends to decommission the automatic site and cease monitoring of NO_2 in Downpatrick. District Council will submit a progress report in 2014.

5 References

TG (2003) Part IV of the Environment Act 1995. Local Air Quality Management: Technical Guidance LAQM.TG(03). Guidance prepared by the Department for Environment, Food and Rural Affairs and the Devolved Administrations, January 2003.

TG (2009) Part IV of the Environment Act 1995. Local Air Quality Management: Technical
Guidance LAQM.TG(09). Guidance prepared by the Department for Environment, Food and Rural Affairs and the Devolved Administrations, February 2009

Appendices

Appendix A: QA/QC Data

Appendix A: QA/QC Data of automatic sites

Down District Council commissioned AEA Technology to provide the QA/QC of the automatic measurements of NO2 from their Market Street site. Local authority staff act as the local site operator and visit the site on a weekly basis carrying out any manual calibration or filter changes required. Audits of the site were carried out by AEA Technology on a six monthly basis.
Environmental Monitoring Services were employed to service and maintain the analyser.

Produced by Ricardo-AEA on behalf of the Eastern Group

DOWNPATRICK
01 January to 31 December 2012

These data have been fully ratified by AEA

POLLUTANT	NO	NO_2	NO_X
Number Very High	-	0	-
Number High	-	0	-
Number Moderate	-	0	-
Number Low	-	8244	-
Maximum 15-minute mean	824 µg m^{-3}	332 µg m^{-3}	1455 µg m^{-3}
Maximum hourly mean	709 µg m^{-3}	195 µg m^{-3}	1219 µg m^{-3}
Maximum running 8-hour mean	514 µg m^{-3}	133 µg m^{-3}	907 µg m^{-3}
Maximum running 24-hour mean	327 µg m^{-3}	94 µg m^{-3}	591 µg m^{-3}
Maximum daily mean	294 µg m^{-3}	93 µg m^{-3}	530 µg m^{-3}
Average	47 µg m^{-3}	38 µg m^{-3}	109 µg m^{-3}
Data capture	93.9 %	93.9 %	93.9 %

All gaseous pollutant mass units are at 20'C and 1013mb.
NO_X mass units are NO_X as NO_2 µgm^{-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

QA/QC of Diffusion Tube Monitoring
The NO_2 tubes are supplied by ESG (Environmental Scientific Group) in Didcot Oxfordshire. Their preparation method is listed below.

Nitrogen Dioxide Diffusion Tube Analysis Report

The samples have been analysed in accordance with ESG's standard operating procedure HS/WI/1015 issue 15. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance.'

The tubes were prepared by spiking acetone:triethanolamine (50:50) onto the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and the extract analysed using a segmented flow autoanalyser with ultraviolet detection. In the WASP intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes, Scientifics is currently ranked as a Category Good laboratory.This result can be found on the LAQM Support Web site
http://laqm.defra.gov.uk/diffusion-tubes/precision.html

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Irish Street 50m		31	34	43	48	43	35	28	28	32	46	42	40
Irish Street 100m		26	33	38	37	30	32	23	25	38	40	37	35
Church Street 50m		63	62	69	58	45	46	43	37	53	67	73	70
Church Street 100m		33	39	44	39	42	37	25	33	29	45	44	41
Market Street 50m		57		61	57	48	47	44	37	50	58	60	53
Market Street 100m					35	42	40	30	36	29	45	44	42
St. Patricks Avenue			62	62		34	45	34	43	42	52	65	56
English Street		24	31	34	18	17	20	15	23	20	26	33	31
Stream Street		41	48	46	31	26	28	26	28	28	41	42	41
St, Patricks Drive		19	22	22	12	11	10	8	9	15	19	24	20
Newcastle		24	30	38	26	25	25	24	32	23	29	29	32

Above shows the monthly results from the diffusion tube sites. All sites had more than nine months data available.

Diffusion Tube Bias Adjustment Factors

The National Bias adjustment factor for ESG is **0.79** found on the LAQM Support Website http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Factor from Local Co-location Studies

The local Market Street bias adjustment factor was calculated using the R&A support precision and accuracy spreadsheet.

http://laqm.defra.gov.uk/bias-adjustment-factors/co-location-data.html

and in accordance to current guidance summarized in the

Technical Guidance LAQM.TG(09).

These results has been included in the national bias adjustment factor database.

Down District Council 2012 **(0.76)**

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	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	30/12/2011	02/02/2012	45.0	44.0	58.0	49	7.8	16	19.4	37	100	Good	Good
2	01/03/2012	01/03/2012	52.0	51.0	44.0	49	4.4	9	10.8	35	100	Good	Good
3	29/03/2012	29/03/2012	60.0	60.0	59.0	60	0.6	1	1.4	41	100	Good	Good
4	29/03/2012	26/04/2012	49.0	48.0	49.0	49	0.6	1	1.4	41	100	Good	Good
5	26/04/2012	29/05/2012	55.0	54.0	55.0	55	0.6	1	1.4	49	70	Good	Poor Data Capture
6	29/05/2012	26/06/2012	54.0	47.0	49.0	50	3.6	7	9.0	42	100	Good	Good
7	02/08/2012	02/08/2012	35.0	54.0	43.0	44	9.5	22	23.7	28	100	Poor Precision	Good
8	02/08/2012	31/08/2012	46.0	47.0	45.0	46	1.0	2	2.5	33	100	Good	Good
9	31/08/2012	27/09/2012	40.0	40.0	41.0	40	0.6	1	1.4	31	100	Good	Good
10	27/09/2012	01/11/2012	51.0	50.0	47.0	49	2.1	4	5.2	43	100	Good	Good
11	01/11/2012	30/11/2012	57.0	59.0	59.0	58	1.2	2	2.9	43	100	Good	Good
12	30/11/2012	04/01/2013	58.0	47.0	57.0	54	6.1	11	15.1	41	100	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

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

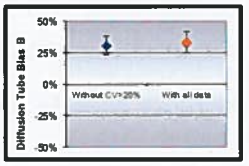
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.77 (0.73 - 0.81)
Bias B	30% (23% - 38%)
Diffusion Tubes Mean:	50 µgm^{-3}
Mean CV (Precision)	6
Automatic Mean:	39 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	39 (37 - 41) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.76 (0.71 - 0.81)
Bias B	32% (24% - 41%)
Diffusion Tubes Mean:	50 µgm^{-3}
Mean CV (Precision)	7
Automatic Mean:	38 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	38 (35 - 40) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Discussion of Choice of Factor to Use

A decision was made to use the local bias adjustment factor; of **0.76**
The tube exposure times were one month
There was 12 months data available with good precision and accuracy of 95% confidence.
There was good QA/QC for both the chemiluminescence analyser and diffusion tubes
The co-location study carried out at the Market Street site is situated according to the technical guidance and the position is of worst case exposure and positioned at relevant exposure.and is similar siting of the other tubes in the study

Using the local factor of **0.76** and not the national factor of 0.79 would not have changed the overall findings. Down District Council having examined the data from the automatic analyser decided it would be a more realistic bias adjustment.

Also Down District Council lies within the Eastern Group area. There are five neighbouring councils within the group. Ards Borough Council does not carry out automatic monitoring of NO_2 but the remaining four have carried out co-location studies. They are all analysed by Environmental Scientific Group the average of these is **0.75**. As Down District Council has confidence in the QA/QC of all the four local studies (all using ratified data),also all the sites are situated in similar location in major provincial towns and climatic conditions, it confirmed the local factor of **0.76** was a realistic adjustment.
They were all calculated using the R&A support precision and accuracy spreadsheet and included in the national bias adjustment factor database

North Down Borough Council 2012

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	28/12/2011	31/01/2012	54.0	52.0	55.0	54	1.5	3	3.8	33	99	Good	Good
2	31/01/2012	28/02/2012	59.0	58.0	43.0	53	9.0	17	22.3	35	99	Good	Good
3	28/02/2012	27/03/2012	56.0	44.0	59.0	53	7.9	15	19.7	36	99	Good	Good
4	27/03/2012	25/04/2012	35.0	37.0	32.0	35	2.5	7	6.3	25	99	Good	Good
5	25/04/2012	28/05/2012	37.0	39.0	36.0	37	1.5	4	3.8	30	99	Good	Good
6	28/05/2012	26/06/2012	38.0	35.0	36.0	36	1.5	4	3.8	29	99	Good	Good
7	26/06/2012	31/07/2012	38.0	35.0	36.0	36	1.5	4	3.8	25	99	Good	Good
8	31/07/2012	28/08/2012	31.0	33.0	33.0	32	1.2	4	2.9	22	99	Good	Good
9	28/08/2012	25/09/2012	35.0	34.0	31.0	33	2.1	6	5.2	24	99	Good	Good
10	25/09/2012	30/10/2012	48.0	47.0	49.0	48	1.0	2	2.5	42	99	Good	Good
11	30/10/2012	27/11/2012	59.0	63.0	64.0	62	2.6	4	6.6	45	99	Good	Good
12	27/11/2012	03/01/2013	56.0	61.0	61.0	59	2.9	5	7.2	49	99	Good	Good
13													
												Good precision	Good Overall DC

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

Overall survey -->

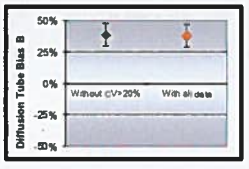
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.73 (0.69 - 0.78)
Bias B	37% (27% - 46%)
Diffusion Tubes Mean:	45 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	33 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	33 (31 - 35) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.73 (0.69 - 0.78)
Bias B	37% (27% - 46%)
Diffusion Tubes Mean:	45 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	33 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	33 (31 - 35) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Lisburn City Council 2012

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	28/12/2011	01/02/2012	32.0	33.0	34.0	33	1.0	3	2.5	27	100	Good	Good
2	01/02/2012	29/02/2012	40.0	38.0	35.0	38	2.5	7	6.3	30	100	Good	Good
3	29/02/2012	28/03/2012	34.0	35.0	27.0	32	4.4	14	10.8	28	100	Good	Good
4	28/03/2012	25/04/2012	22.0	26.0	23.0	24	2.1	9	5.2	28	100	Good	Good
5	25/04/2012	28/05/2012	20.0	20.0	19.0	20	0.6	3	1.4	22	100	Good	Good
6	28/05/2012	27/06/2012	23.0	25.0	28.0	25	2.5	10	6.3	20	100	Good	Good
7	27/06/2012	01/08/2012	10.0	24.0	21.0	18	7.4	40	18.3	18	100	Poor Precision	Good
8	01/08/2012	29/08/2012	21.0	23.0	20.0	21	1.5	7	3.8	17	100	Good	Good
9	28/11/2012	02/01/2013	42.0	40.0	40.0	41	1.2	3	2.9	32	100	Good	Good
10													
11													
12													
13													
											Overall survey -->	Good precision	Good Overall DC

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

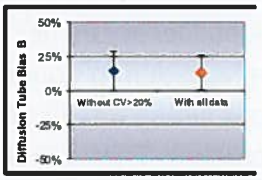
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 8 out of 9 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 8 periods of data	
Bias factor A	0.87 (0.78 - 1)
Bias B	14% (0% - 29%)
Diffusion Tubes Mean:	29 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	26 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	25 (23 - 29) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 9 periods of data	
Bias factor A	0.88 (0.79 - 0.99)
Bias B	13% (1% - 26%)
Diffusion Tubes Mean:	28 µgm^{-3}
Mean CV (Precision):	11 caution
Automatic Mean:	25 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	25 (22 - 28) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Down District Council 2012

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	30/12/2011	02/02/2012	45.0	44.0	58.0	49	7.8	16	19.4	37	100	Good	Good
2	01/03/2012	01/03/2012	52.0	51.0	44.0	49	4.4	9	10.8	35	100	Good	Good
3	29/03/2012	29/03/2012	60.0	60.0	59.0	60	0.6	1	1.4	41	100	Good	Good
4	29/03/2012	26/04/2012	49.0	48.0	49.0	49	0.6	1	1.4	41	100	Good	Good
5	26/04/2012	29/05/2012	55.0	54.0	55.0	55	0.6	1	1.4	49	70	Good	or Data Capture
6	29/05/2012	26/06/2012	54.0	47.0	49.0	50	3.6	7	9.0	42	100	Good	Good
7	02/08/2012	02/08/2012	35.0	54.0	43.0	44	9.5	22	23.7	28	100	Poor Precision	Good
8	02/08/2012	31/08/2012	46.0	47.0	45.0	46	1.0	2	2.5	33	100	Good	Good
9	31/08/2012	27/09/2012	40.0	40.0	41.0	40	0.6	1	1.4	31	100	Good	Good
10	27/09/2012	01/11/2012	51.0	50.0	47.0	49	2.1	4	5.2	43	100	Good	Good
11	01/11/2012	30/11/2012	57.0	59.0	59.0	58	1.2	2	2.9	43	100	Good	Good
12	30/11/2012	04/01/2013	58.0	47.0	57.0	54	6.1	11	15.1	41	100	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

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

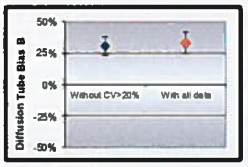
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.77 (0.73 - 0.81)
Bias B	30% (23% - 38%)
Diffusion Tubes Mean:	50 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	39 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	39 (37 - 41) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.76 (0.71 - 0.81)
Bias B	32% (24% - 41%)
Diffusion Tubes Mean:	50 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	38 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	38 (35 - 40) µgm^{-3}



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Version 04 - February 2011

Castlereagh Borough Council 2012

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	29/12/2011	02/02/2012	55.0	49.0	61.0	55	6.0	11	14.9	35	99	Good	Good
2	02/02/2012	01/03/2012	63.0	60.0	64.0	62	2.1	3	5.2	34	99	Good	Good
3	01/03/2012	29/03/2012	56.0	60.0	56.0	57	2.3	4	5.7	39	99	Good	Good
4	29/03/2012	23/04/2012	45.0	48.0	46.0	46	1.5	3	3.8	28	99	Good	Good
5	23/04/2012	28/05/2012	43.0	50.0	42.0	45	4.4	10	10.8	30	99	Good	Good
6	28/05/2012	02/07/2012	41.0	39.0	43.0	41	2.0	5	5.0	23	99	Good	Good
7	02/07/2012	30/07/2012	30.0	32.0	34.0	32	2.0	6	5.0	15	99	Good	Good
8	30/07/2012	31/08/2012	32.0	30.0	31.0	31	1.0	3	2.5	18	99	Good	Good
9	31/08/2012	24/09/2013	39.0	38.0	43.0	40	2.6	7	6.6	23	99	Good	Good
10	24/09/202	29/10/2012	47.0	48.0	43.0	46	2.6	6	6.6	30	99	Good	Good
11	29/10/2012	26/11/2012	59.0	59.0	59.0	59	0.0	0	0.0	36	99	Good	Good
12	26/11/2012	03/01/2013	57.0	61.0	61.0	60	2.3	4	5.7	44	99	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

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

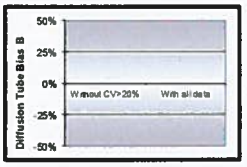
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.62 (0.57 - 0.67)
Bias B	62% (49% - 75%)
Diffusion Tubes Mean:	48 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	30 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	30 (27 - 32) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.62 (0.57 - 0.67)
Bias B	62% (49% - 75%)
Diffusion Tubes Mean:	48 µgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	30 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	30 (27 - 32) µgm^{-3}



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Version 04 - February 2011