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East Dunbartonshire Council

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# 2015 Updating and Screening Assessment for

# EAST DUNBARTONSHIRE COUNCIL

## In fulfillment of Part IV of the

## Environment Act 1995

## Local Air Quality Management

# October 2015

| | |
|---|---|
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# Executive Summary

This report is the 2015 Updating and Screening Assessment, undertaken in accordance with East Dunbartonshire Council's statutory obligation under the National Air Quality Strategy.

The report considers measured pollutant concentrations from within East Dunbartonshire Council area for the calendar year 2014 and considers the potential for exceedences of air quality objectives as a result of new or significantly changed local emission sources.

East Dunbartonshire Council continue to work towards improving air quality in the area and has two Air Quality Management Areas (AQMA's) one in Bearsden and one in Bishopbriggs, with an Action Plan already in place for Bishopbriggs and one being implemented for Bearsden.

Measured pollutant concentrations across the council area in 2014 were typically lower than those measured in 2013. Measured concentrations of $NO_2$ and $PM_{10}$ at Bearsden, Bishopbriggs, Kirkintilloch and Milngavie in 2014 all met the air quality objectives.

No new or significantly changed emission sources were identified within East Dunbartonshire which have potential to cause exceedences of air quality objectives.

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# 1 Introduction

## 1.1 Description of Local Authority Area

The East Dunbartonshire Council area covers approximately 200 square kilometres located to the north of Glasgow and is bordered by Glasgow City Council to the south, West Dunbartonshire Council to the west, Stirling Council to the north and North Lanarkshire Council to the east. The local authority area is landlocked and contains a mixture of both urban and rural areas. A map of East Dunbartonshire area is provided in Appendix A.

The population of East Dunbartonshire is approximately 105,000 with the majority of residents based in the urban areas to the south, which are contiguous with Glasgow. The main urban centres are Kirkintilloch, Bishopbriggs, Lenzie, Bearsden and Milngavie. The northern part of East Dunbartonshire is largely rural with a few small population centres in Torrance, Lennoxtown, Twechar and Milton of Campsie. There are relatively low levels of industrial activity within the local authority area.

## 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.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

## 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) Amendment Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre μg/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 1.1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in Scotland**

| Pollutant | Air Quality Objective | | Date to be achieved by |
|---|---|---|---|
| | Concentration | Measured as | |
| Benzene | 16.25 μg/m$^3$ | Running annual mean | 31.12.2003 |
| | 3.25 μg/m$^3$ | Running annual mean | 31.12.2010 |
| 1,3-Butadiene | 2.25 μg/m$^3$ | Running annual mean | 31.12.2003 |
| Carbon monoxide | 10.0 mg/m$^3$ | Running 8-hour mean | 31.12.2003 |
| Lead | 0.5 μg/m$^3$ | Annual mean | 31.12.2004 |
| | 0.25 μg/m$^3$ | Annual mean | 31.12.2008 |
| Nitrogen dioxide | 200 μg/m$^3$ not to be exceeded more than 18 times a year | 1-hour mean | 31.12.2005 |
| | 40 μg/m$^3$ | Annual mean | 31.12.2005 |
| Particles ($PM_{10}$) (gravimetric) | 50 μg/m$^3$, not to be exceeded more than 7 times a year | 24-hour mean | 31.12.2010 |

| Pollutant | Air Quality Objective | | Date to be achieved by |
|---|---|---|---|
| | Concentration | Measured as | |
| | 18 µg/m$^3$ | Annual mean | 31.12.2010 |
| Sulphur dioxide | 350 µg/m$^3$, not to be exceeded more than 24 times a year | 1-hour mean | 31.12.2004 |
| | 125 µg/m$^3$, not to be exceeded more than 3 times a year | 24-hour mean | 31.12.2004 |
| | 266 µg/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

A brief summary of all previous reviews and assessments of local air quality since 2003 in East Dunbartonshire are presented in Table 1.2 and described further in the following texts.

**Table 1.2 Details of local air quality reviews submitted by East Dunbartonshire Council**

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| May 2003 | Updating and Screening Assessment (2003 U&SA) | The risk of exceeding $NO_2$ and $PM_{10}$ objectives at several busy roads and junctions was identified in Bishopbriggs, Bearsden and Milngavie. |
| September 2004 | Detailed Assessment of $NO_2$ and $PM_{10}$ (2004 DA) | The assessment considered $NO_2$ and $PM_{10}$ concentrations resulting from road traffic emissions along the A803 in Bishopbriggs, and the A81 and A809 in Bearsden and Milngavie. The assessment concluded that annual mean $NO_2$ and $PM_{10}$ objectives would be exceeded and that an Air Quality Management Area (AQMA) should be declared in Bishopbriggs. The study also identified potential exceedences of the 2010 annual mean $PM_{10}$ air quality objective within Bearsden and Milngavie. However, further action was deferred until the modelling results could be verified with monitored data |
| April 2005 | Addendum to Detailed Assessment of $NO_2$ and $PM_{10}$ (2004 DA-Addendum) | |
| May 2005 | Progress Report (2005 PR) | No new areas were identified where exceedences of NAQS objectives were predicted. The intention to declare an AQMA in Bishopbriggs was confirmed. Following the results of the DA it |

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| | | was noted that the Council intended to install automatic monitoring for $PM_{10}$ and $NO_2$ in Bearsden |
| October 2005 | Bishopbriggs AQMA declaration | An AQMA covering a 60m corridor along the A803 Kirkintilloch Road between Colston Road and a point 30m north of Cadder Roundabout was declared on 23rd October 2005 and implemented on 23rd December 2005. |
| June 2006 | Updating and Screening Assessment (2006 U&SA) | The risk of $NO_2$ and $PM_{10}$ objectives being exceeded at Bearsden Cross was identified. Due to a low data capture rate at automatic monitoring site it was recommended that further monitoring was carried out prior to proceeding to a Detailed Assessment. |
| May 2007 | Bishopbriggs AQMA Further Assessment (2007 FA) | The Further Assessment confirmed the requirement for an AQMA, for both $NO_2$ and $PM_{10}$, in Bishopbriggs. The Further Assessment considered two proposed future road traffic emission scenarios: the implementation of a quality bus corridor on the A803; and completion of the Bishopbriggs Relief Road. The assessment concluded that both options would generally improve air quality within the AQMA but that there may be a marginal increase in pollutant concentrations at the junction between Colston Road and Kirkintilloch Road at the south of the AQMA as a result of both schemes. The assessment concluded that the completion of the Bishopbriggs Relief Road in addition to the implementation of the quality bus corridor would achieve the highest improvement in air quality within the AQMA, although concentrations of both pollutants were still predicted to exceed the NAQS objectives in 2010. |

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| June 2007 | Progress Report (2007 PR) | The report identified that measured $NO_2$ concentrations at four sites in Bearsden and one in Milngavie exceeded the annual mean $NO_2$ objective. Potential exceedences of the $PM_{10}$ annual mean and 24 hour mean objectives were identified in Bearsden and Milngavie. It was concluded that a Detailed Assessment of $NO_2$ and $PM_{10}$ was required for busy junctions in Bearsden and Milngavie. |
| October 2007 | Bishopbriggs AQMA Further Assessment (2007 FA-Addendum) | The Addendum report included additional information on source apportionment within the AQMA. It was identified that transboundary sources accounted for the greatest proportion of both $PM_{10}$ and NOx concentrations. The greatest contributions from local sources were from road traffic and commercial and domestic sources. It was shown that particulate emissions from tyre, break wear and re-suspension contributed significantly to road traffic emissions of $PM_{10}$ and HGVs were the greatest contributor to road traffic emissions of NOx. |
| January 2008 | Bishopbriggs AQMA Draft Action Plan (2008 AP-draft) | Following the a series of consultations with the local community and stakeholders, including a citizens panel questionnaire, a short-life working group and 2 workshops; the Draft Action Plan was issued in conjunction with the Local Transport Strategy (LTS). A joint Strategic Environmental Assessment (SEA) was undertaken separately which assessed the wider impacts of both the LTS and AP. |

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| April 2008 | Detailed Assessment Bearsden & Milngavie (2008 DA) | The assessment of $NO_2$ and $PM_{10}$ concentrations in Bearsden and Milngavie concluded that there were some areas within Bearsden and Milngavie where predicted $NO_2$ and $PM_{10}$ concentrations were above the respective air quality objectives; however, the locations were not classified as locations of relevant public exposure. Furthermore, there were several areas along Drymen Road at which predicted concentrations were close to, but not exceeding, the 2010 annual mean $PM_{10}$ objective. Based on the results of the Detailed Assessment it was concluded that an AQMA in Bearsden or Milngavie was not required; however, further monitoring was recommended. |
| August 2008 | Progress Report (2008 PR) | No identified or predicted exceedences of NAQS objectives |
| March 2009 | Bishopbriggs AQMA Final Action Plan (2009 AP) | Following consultation with SEPA, neighbouring local authorities, all Council departments and the Scottish Government the final version Action Plan was issued. |
| July 2009 | Bishopbriggs AQMA – Progress Report (2009 PR) | Measured $NO_2$ concentrations within the AQMA indicate two exceedences during 2008. Measured concentrations of $PM_{10}$ are in compliance with the 2010 NAQS objectives. |

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| September 2009 | Updating and Screening Assessment (2009 U&SA) | The review of monitoring data identified exceedences of the annual mean NAQS objective for $NO_2$ and predicted exceedences of the 2010 annual mean NAQS objective for $PM_{10}$ at locations of relevant exposure along Drymen Road in Bearsden. East Dunbartonshire Council intend to declare an AQMA along Drymen Road in Bearsden in respect to measured and predicted exceedences of the annual mean NAQS objectives for $NO_2$ and $PM_{10}$. An Automatic Air Quality Analyser is being installed in Milngavie to ensure that the annual mean objective is not exceeded. The $PM_{10}$ monitoring data for Bishopbriggs indicate that concentrations within the AQMA have reduced such that the 2010 annual mean objective for $PM_{10}$ is not being exceeded. $NO_2$ concentrations continue to exceed the annual mean NAQS objective at some locations within the AQMA. |
| May 2010 | Progress Report (2010 PR) | The measured $PM_{10}$ concentration at Kirkintilloch exceeds the 2010 annual mean objective, giving a level of 22.5 $\mu g/m^3$ however; the construction of the Kirkintilloch Link Road is taking place very close by. It is anticipated that the $PM_{10}$ level will decrease once the Kirkintilloch Link Road is complete in the summer of 2010. An Automatic Air Quality Analyser is being installed in Milngavie to ensure that the annual mean objective is not exceeded. |
| August 2011 | Progress Report (2011 PR) | The installation of a new automatic monitoring site in Milngavie is expected to be operational by August 2011. Measured concentrations of both $NO_2$ and $PM_{10}$ at Kirkintilloch are in excess of the relevant annual mean objectives at 45µg/m³ and 26µg/m³ respectively. The construction of the Kirkintilloch Link Road was completed in November 2010. It is the Council's intention to proceed to a Detailed Assessment for both pollutants in this area. |

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| October 2012 | Updating and Screening Assessment (2012 U&SA) | Measured pollutant concentrations across the council area were typically lower than those measured in 2010. The Detailed Assessment of Kirkintilloch is currently underway. Measured $PM_{10}$ concentrations exceeded the annual mean objective at the automatic monitoring sites in Bearsden and Kirkintilloch in 2011 however with an observed decrease in measured concentrations at both locations from 2010 to 2011. The automatic monitoring site at Bearsden recorded a decrease in the annual mean concentration of 5µg/m³ while a decrease of 7µg/m³ was recorded at Kirkintilloch. This is thought to have been influenced by 2010 having a particularly high background concentration of $PM_{10}$. A similar drop in annual mean concentrations of $PM_{10}$ has been seen across the UK from 2010 to 2011. |
| November 2012 | Bishopbriggs Air Quality Action Plan Update | Of the 41 actions in the original Bishopbriggs Action Plan, only 11 have not been progressed. The remainder are either complete or underway. |
| May 2013 | Progress Report (2013 PR) | The report highlighted that air quality is improving overall with only two exceedences of the Local Air Quality Management (LAQM) objective in 2012 which was the measured annual mean $NO_2$ concentration at Bearsden Cross and a diffusion tube at Bishopbriggs 13. Three out of the four sites in the council area met the daily mean objective for $PM_{10}$ and the fourth site had incomplete data so could not be used for 2012. The number of measured $PM_{10}$ exceedences did not breach the number of permitted exceedences in 2012. |

| Date submitted | Assessment | Report Conclusions |
|---|---|---|
| December 2013 | Kirkintilloch Detailed Assessment (2013 DA) | Adjusted dispersion modelling predictions indicate $NO_2$ and $PM_{10}$ annual mean are being exceeded and the Council should proceed with declaring an AQMA at Kirkintilloch to include all areas of exceedence. |
| June 2014 | Progress Report (2014 PR) | This report highlights that air quality is improving overall with only one exceedence of the annual mean concentration objective in 2013 which was the $NO_2$ diffusion tube at Bishopbriggs 13. The council met the daily mean objective for $PM_{10}$ although two of the four monitors had incomplete data so could not be used for 2013. The Detailed Assessment of Kirkintilloch concluded that an area of Kirkintilloch should be declared for $NO_2$ and $PM_{10}$ annual mean exceedences, however the data for 2013 would suggest otherwise. As there have been no exceedences of $NO_2$ or $PM_{10}$ annual mean concentrations for both 2012 and 2013 this would suggest that there may be no requirement on the council to declare an AQMA however this will require clarification. The continued decline in emissions highlights that the construction of the Kirkintilloch Link Road contributed to elevated levels of $NO_2$ and $PM_{10}$. |

**Figure 1.1 Map of Bishopbriggs AQMA Boundary**

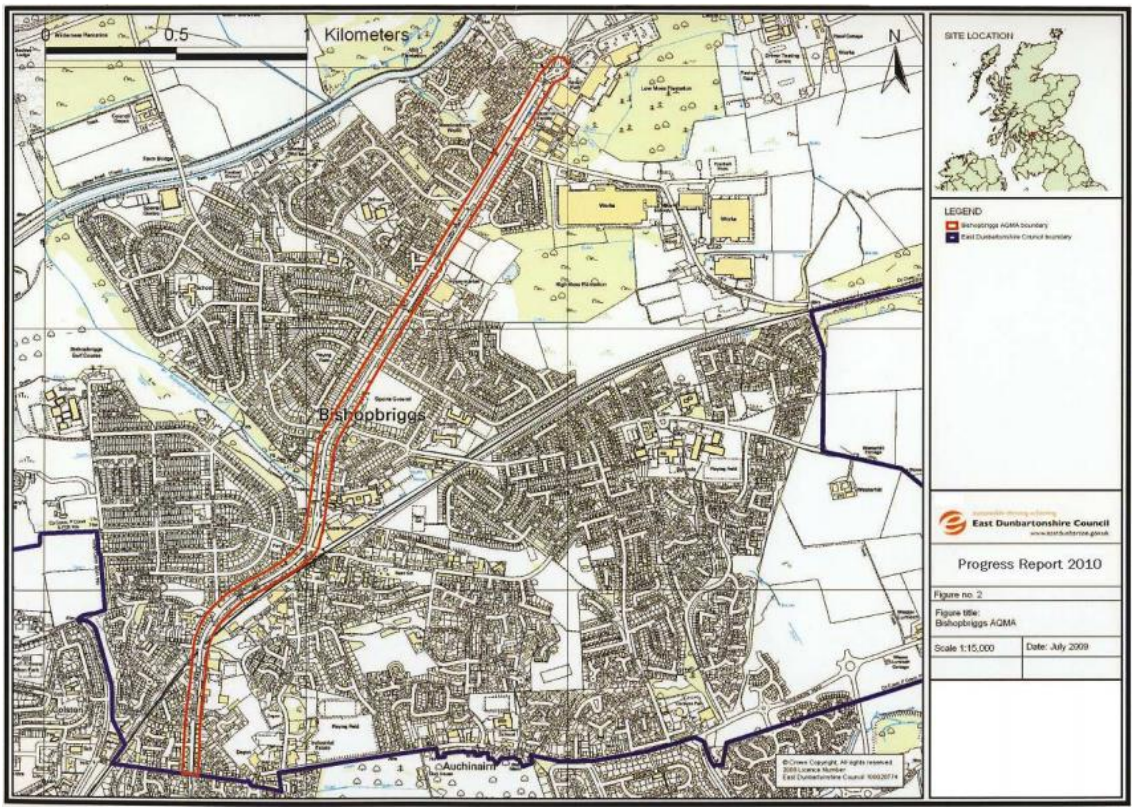
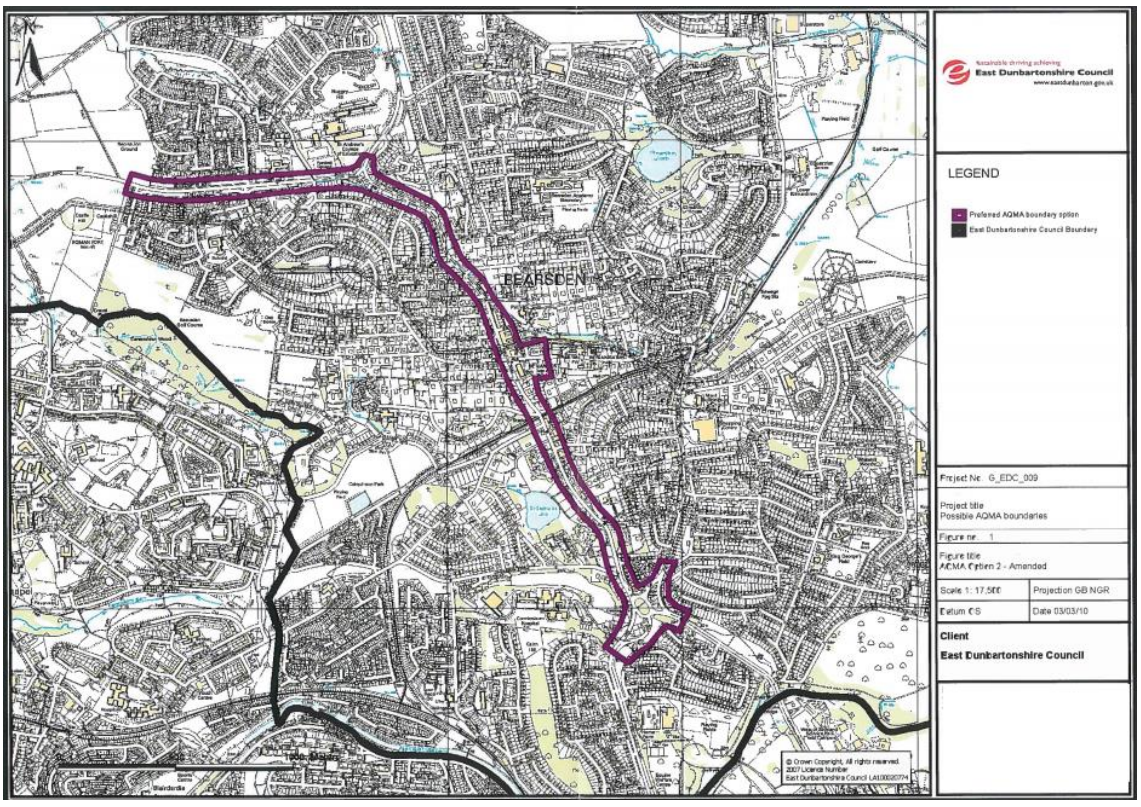



**Figure 1.2 Map of Bearsden AQMA Boundary**



# 2 New Monitoring Data

## 2.1 Summary of Monitoring Undertaken

East Dunbartonshire Council monitor $NO_2$ and $PM_{10}$ using a combination of automatic analysers and passive diffusion tubes (PDT). The automatic monitoring sites are presented in Table 2.1 and the details of non-automatic monitoring sites are presented in Table 2.2.

Since the Progress Report in 2013 the Partisol air monitor was installed at Milngavie Road, Bearsden to monitor $PM_{10}$. This is an indicative monitoring study to ascertain whether the Bearsden AQMA should be extended.

For all air monitors there have been regular calibrations, services and audits. Details of the quality control and data correction processes carried out are reported in Appendix B.

All automatic monitoring $NO_2$ and $PM_{10}$ data has been fully ratified by Ricardo-AEA on behalf of the Scottish Government.

Diffusion tube data has been corrected using the national and local bias correction factor.

### 2.1.1 Automatic Monitoring Sites

East Dunbartonshire Council operate four automatic NOx analysers and five automatic $PM_{10}$ monitors. The analysers are located at five sites:

- the junction of Drymen Road (A809) and Roman Road in Bearsden (since December 2005)
- the junction of Kirkintilloch Road (A803) with Springfield Road and Kenmure Avenue in Bishopbriggs (since December 2003)
- the Townhead junction in Kirkintilloch (since October 2007)
- the junction of Main Street and Park Road, Milngavie (since August 2011)
- the junction of Milngavie Road and Kessington Road, Bearsden (since August 2013)

There are NOx and $PM_{10}$ analysers at each monitoring site with the exception of the gravimetric Partisol analyser at Kessington Road, Bearsden which just monitors $PM_{10}$.

The locations of the automatic monitoring sites are annotated in Appendix A, Figures A.2, A.3, A.4 and A.5.

**Table 2.1 Details of Automatic Monitoring Sites**

| Site Name | Site Type | OS Grid Ref | Pollutants Monitored | In AQMA? | Monitoring Technique | 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? |
|---|---|---|---|---|---|---|---|---|
| Bearsden 16 | Kerbside | 254269 672067 | $NO_2$ $PM_{10}$ | Y | Horiba 360, Eberline (heated inlet) | Y<2m | 1m | Y |
| Bearsden 2025 | Kerbside | 255015 671477 | $PM_{10}$ | N | Partisol | Y | 1m | Y |
| Bishopbriggs 14 | Roadside | 260995 670130 | $NO_2$ $PM_{10}$ | Y | Horiba 360, Eberline (heated inlet) | Y 5m | 2 m to nearest road 10m to junction with main road | N |
| Kirkintilloch 17 | Kerbside | 265700 673500 | $NO_2$ $PM_{10}$ | N | Thermo 42i TEOM (FDMS) | Y <2m | 1m | Y |
| Milngavie 10 | Roadside | 255328 674115 | $NO_2$ $PM_{10}$ | N | Thermo 42i TEOM (FDMS) | Y | 2m | Y |

### 2.1.2 Non-Automatic Monitoring Sites

East Dunbartonshire Council maintain a network of 42 $NO_2$ diffusion tube sites located across the council area. The monitoring sites represent public exposure and areas of high pollution concentrations at a variety of kerbside, roadside and urban background locations. The locations of the non-automatic monitoring sites are also annotated in Appendix A, Figures 1.4, 1.5, 1.6 and 1.7.

**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) | Worst case Location? |
|---|---|---|---|---|---|---|---|---|---|
| Bearsden 1 (118 Drymen Road) | R | 254218 | 672193 | $NO_2$ | Y | N | Y (3m) | 2m | Y |
| Bearsden 3 (5 Ravelston Road) | UB | 254655 | 670158 | $NO_2$ | N | N | N (8m) | 5m | Y |
| Bearsden 4 (8 Lowther Ave) | UB | 253075 | 673382 | $NO_2$ | N | N | N (6m) | 5m | Y |
| Bearsden 7 | R | 254269 | 672069 | $NO_2$ | Y | N | Y (<2m) | 2m | Y |
| Bearsden 8 | R | 254275 | 672047 | $NO_2$ | Y | N | N (18m) | 2m | Y |
| Bearsden 9 | R | 254751 | 670621 | $NO_2$ | N | N | N (30m) | 2m | Y |
| Bearsden 10 | R | 255394 | 670683 | $NO_2$ | N | N | N (24m) | 2m | Y |
| Bearsden 13 | R | 254809 | 671057 | $NO_2$ | Y | N | Y (26m) | 2m | Y |

| 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) | Worst case Location? |
|---|---|---|---|---|---|---|---|---|---|
| Bearsden 14 | R | 254877 | 671000 | $NO_2$ | Y | N | Y ( 8m) | 2m | N |
| Bearsden 15 | R | 254898 | 671023 | $NO_2$ | Y | N | Y (2m) | 2m | Y |
| Bearsden 16 | K | 254269 | 672067 | $NO_2$ | Y | Y | Y (2m) | 1m | Y |
| Bearsden 16B | K | 254269 | 672067 | $NO_2$ | Y | Y | Y (2m) | 1m | Y |
| Bearsden 16C | K | 254269 | 672067 | $NO_2$ | Y | Y | Y (2m) | 1m | Y |
| Bearsden 17 | R | 254258 | 672077 | $NO_2$ | Y | N | Y(<2m) | 2m | Y |
| Bearsden 18 | R | 254275 | 672069 | $NO_2$ | Y | N | Y(<2m) | 2m | Y |
| Bishopbriggs 12 | R | 260581 | 669527 | $NO_2$ | Y | N | N (4m) | 2m | Y |
| Bishopbriggs 13 | R | 260549 | 669312 | $NO_2$ | Y | N | N (5m) | 2m | Y |

| 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) | Worst case Location? |
|---|---|---|---|---|---|---|---|---|---|
| Bishopbriggs 14 | R | 260995 | 670130 | $NO_2$ | Y | Y | N (42m) | 2m | N |
| Bishopbriggs 14B | R | 260995 | 670130 | $NO_2$ | Y | Y | N (42m) | 2m | N |
| Bishopbriggs 14C | R | 260995 | 670130 | $NO_2$ | Y | Y | N (42m) | 2m | N |
| Bishopbriggs 16 | R | 260580 | 669533 | $NO_2$ | Y | N | Y (<2m) | 2m | Y |
| Bishopbriggs 17 | R | 260552 | 669320 | $NO_2$ | Y | N | Y (<2m) | 2m | Y |
| Bishopbriggs 18 | UB | 260604 | 670337 | $NO_2$ | N | N | N (20m) | 2m | N |
| Bishopbriggs 19 | R | 261280 | 670431 | $NO_2$ | N | N | Y (1m) | 16m | Y |
| Bishopbriggs 20 | R | 261285 | 670451 | $NO_2$ | N | N | N (15m) | 1m | N |
| Bishopbriggs 5 | UB | 260948 | 669610 | $NO_2$ | N | N | N (44m) | 5m | N |

| 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) | Worst case Location? |
|---|---|---|---|---|---|---|---|---|---|
| Bishopbriggs 6 | R | 261016 | 670198 | $NO_2$ | Y | N | Y (<2m) | 2m | Y |
| Kirkintilloch 15 | R | 265641 | 673497 | NO2 | N | N | Y (2m) | 2m | Y |
| Kirkintilloch 16 | R | 265697 | 673524 | $NO_2$ | N | N | N (3m) | 2m | Y |
| Kirkintilloch 17 | K | 265675 | 673516 | $NO_2$ | N | Y | Y (3m) | 1m | Y |
| Kirkintilloch 17B | K | 265675 | 673516 | $NO_2$ | N | Y | Y (3m) | 1m | Y |
| Kirkintilloch 17C | K | 265675 | 673516 | $NO_2$ | N | Y | Y (3m) | 1m | Y |
| Kirkintilloch 18 | R | 265674 | 673521 | $NO_2$ | N | Y | Y (<2m) | 2m | Y |
| Milngavie 4 | R | 255728 | 674486 | $NO_2$ | N | N | N (5m) | 2m | Y |
| Milngavie 5 | R | 255327 | 674137 | $NO_2$ | N | N | N (5m) | 2m | Y |

| 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) | Worst case Location? |
|---|---|---|---|---|---|---|---|---|---|
| Milngavie 6 | R | 255288 | 674121 | $NO_2$ | N | N | N (2m) | 2m | Y |
| Milngavie 7 | R | 255279 | 674124 | $NO_2$ | N | N | N (<2m) | 9m | Y |
| Milngavie 8 | R | 255251 | 674198 | $NO_2$ | N | N | N (3m) | 1m | Y |
| Milngavie 9 | R | 255331 | 674214 | $NO_2$ | N | N | Y (7m) | 2m | Y |
| Milngavie 10 | R | 255325 | 674116 | NO2 | N | Y | Y | 1m | Y |
| Milngavie 10 B | R | 255325 | 674116 | NO2 | N | Y | Y | 1m | Y |
| Milngavie 10 C | R | 255325 | 674116 | NO2 | N | Y | Y | 1m | Y |

## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide

#### Automatic Monitoring Data

The annual mean and 1-hour mean $NO_2$ automatic monitoring data for 2014 and previous years are presented in Tables 2.3 and 2.4 respectively, and Chart 1.1 shows the annual mean concentrations in graph form. Measured exceedences of NAQS objectives are highlighted in bold.

The data capture rate of all the analysers was good, with a data capture rate of 93% or greater achieved at all four sites in 2014.

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

| Site ID | Site Type | Within AQMA? | Valid Data Capture for period of monitoring %[a] | Valid Data Capture 2014 % [b] | Annual Mean Concentration µg/m$^3$ (Objective ≤ 40 µg/m$^3$) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| Bearsden | Kerbside | Y | 99 | 99 | 39.4 | 44.1 | 39.6 | 47 | 39.5 | 41.4 | 36 | 37 |
| Bishopbriggs | Roadside | Y | 93 | 93 | 34.1 | 31.5 | 33.4 | 33 | 35.7* | 30 | 32 | 29 |
| Kirkintilloch | Kerbside | N | 97 | 97 | - | 35.6 | 42 | 45 | 43 | 34 | 31 | 29 |
| Milngavie | Roadside | N | 97 | 97 | - | - | - | - | - | 25 | 23 | 24 |

*Annualised in line with LAQM TG (09)

**Chart 2.1 Trends in Annual Mean Nitrogen Dioxide Concentrations measures at Automatic Monitoring Sites**

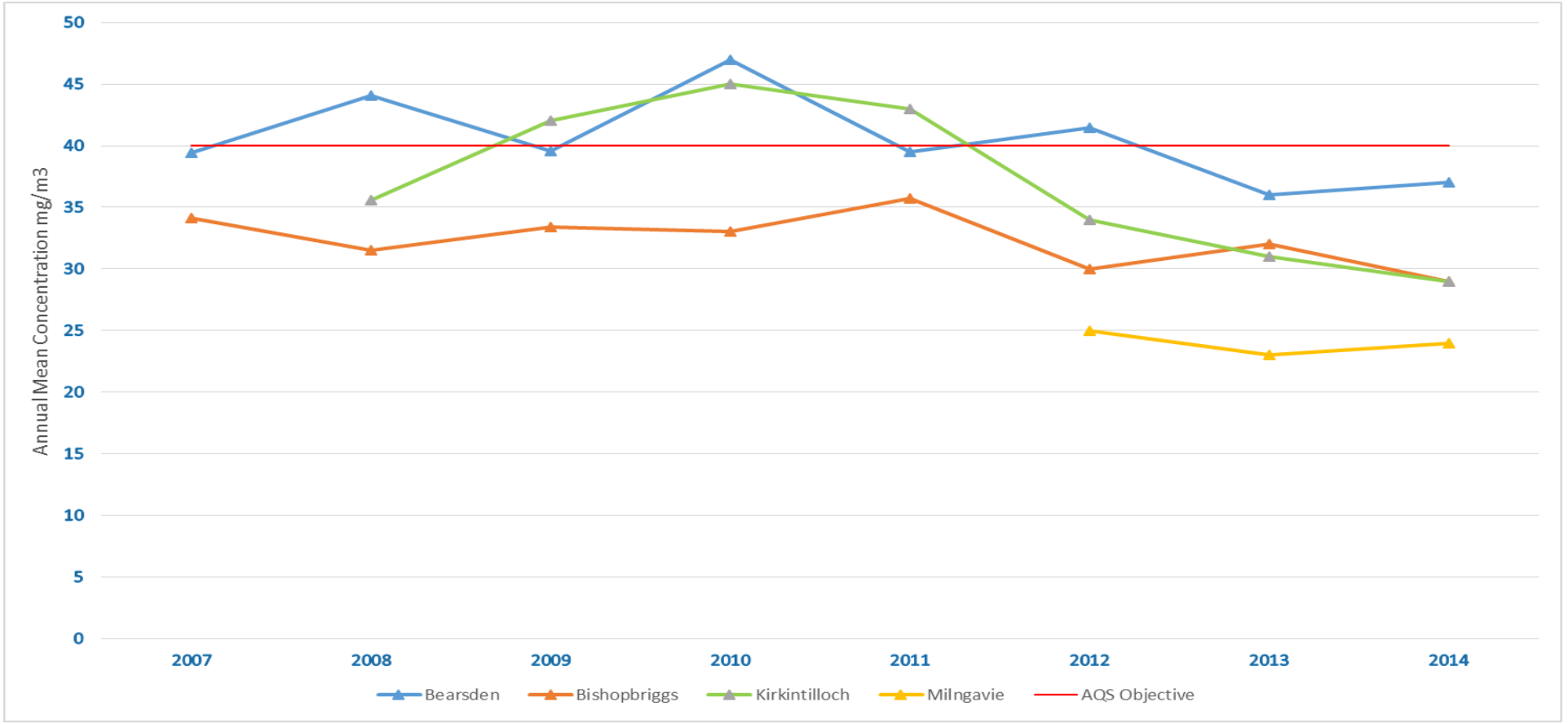


**Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective**

| Site ID | Site Type | Within AQMA? | Number of Exceedences of Hourly Mean (200 µg/m$^3$ not to be breached >18 times per year) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| Bearsden | Kerbside | Y | 0 | 3 | 19 | 37 | 0 | 1 | 5 | 0 |
| Bishopbriggs | Roadside | Y | 0 | 0 | 1 | 0 | 0 (115) | 0 | 0 | 0 |
| Kirkintilloch | Kerbside | N | - | 0 | 0 | 4 | 0 (151) | 4 | 12 | 0 |
| Milngavie | Roadside | N | - | - | - | | 0 | 0 | 0 | 0 |

### Bearsden

The measured annual mean $NO_2$ concentration at Bearsden in 2014 was 37 µg/m³, which is below the annual mean objective level of 40 µg/m³.

Chart 1.1 demonstrates that the annual mean concentration of $NO_2$ at Bearsden from 2007 to 2012 was sitting on, or around, the annual mean objective limit of 40 µg/m³ however during 2013 and 2014 the annual mean concentration was below the annual mean objective at 36 µg/m³ and 37 µg/m³ respectively. The past years have shown a significant decrease compared to 2010 when it was at its highest $NO_2$ annual mean concentration of 47 µg/m³.

There were no recorded exceedences of the $NO_2$ hourly mean at Bearsden.

### Bishopbriggs

The measured annual mean $NO_2$ concentration at Bishopbriggs in 2014 was 29 µg/m³, which is below the annual mean objective level of 40 µg/m³. Chart 1.1 shows that annual mean NO2 concentrations have been below the annual mean concentration objective of 40 µg/m³ since 2007 with concentrations of between 31 µg/m³ and 35 µg/m³.

There were no recorded exceedences of the 1-hour objective for $NO_2$ at Bishopbriggs. Measured $NO_2$ concentrations at the Bishopbriggs monitoring site during 2014. Both the annual mean and 1-hour mean NAQS objectives for $NO_2$ are being met at Bishopbriggs site.

### Kirkintilloch

The measured annual mean $NO_2$ concentration at Kirkintilloch in 2014 was 29µg/m³, which is below the annual mean objective level of 40µg/m. There were no measured exceedences of the 1-hour objective for $NO_2$.

Chart 1.1 highlights a clear trend in the six year period when monitoring started in 2007 at 35.6 µg/m³, rising to a peak of 45 µg/m³ in 2010 and then decreasing over the past three years to 34 µg/m³ in 2012, 31 µg/m³ in 2013 and 29 µg/m³ in 2014.

### Milngavie

Measured $NO_2$ concentrations at the Milngavie site during 2014 were below both the annual mean and 1-hour mean objectives for $NO_2$ indicating that the objectives for $NO_2$ are being met at Milngavie.

## Diffusion Tube Monitoring Data

East Dunbartonshire Council maintain a network of 42 $NO_2$ diffusion tube sites located across the council area. The monitoring sites represent public exposure and areas of high pollution concentrations at a variety of roadside and urban background locations. The locations of the non-automatic monitoring sites are annotated in Appendix A, Figures 1.4, 1.5, 1.6 and 1.7.

The $NO_2$ diffusion tube monitoring data for 2014 and previous years are presented in Table 2.5 and Table 2.6. Data capture for all sites, with the exception of two were greater than 92%. Bishopbriggs 19 and 20 were added to the network in May 2014 (data Capture for 2014 62%). Therefore, it has been necessary to annualise measured concentrations at two locations. The diffusion tube monitoring results have been adjusted for laboratory bias. Further detail of the annualisation and laboratory bias adjustment is provided in Appendix B. Results have not been distance corrected as no sites met the necessary criteria. Trend charts of historic diffusion tube data at urban background and roadside and kerbside sites are presented in Charts 2.2, 2.3 and 2.4 respectively.

**Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2014**

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Bearsden 1 | 118 Drymen Road | R | Y | N | 92% | N | N | 28.8 |
| Bearsden 3 | 5 Ravelstoun Road | UB | N | N | 100% | N | N | 18.5 |
| Bearsden 4 | 8 Lowther Avenue | UB | N | N | 100% | N | N | 11.4 |
| Bearsden 7 | Bearsden Cross Traffic lights | R | Y | N | 100% | N | N | 31.0 |
| Bearsden 8 | Bearsden Cross hanging basket | R | Y | N | 100% | N | N | 33.4 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Bearsden 9 | Braemar Crescent | R | N | N | 100% | N | N | 20.1 |
| Bearsden 10 | Maryhill Road/ Rannoch Drive | R | N | N | 92% | N | N | 26.1 |
| Bearsden 13 | Canniesburn Toll | R | Y | N | 100% | N | N | 35.2 |
| Bearsden 14 | Milngavie Road at Canniesburn Toll | R | Y | N | 100% | N | N | 30.2 |
| Bearsden 15 | Milngavie Road | R | Y | N | 92% | N | N | 27.6 |
| Bearsden 16 | 102 Drymen Rd | K | Y | Y | 100% | N | N | 33.9 |
| Bearsden 16B | 102 Drymen Rd | K | Y | Y | 100% | N | N | 34.5 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Bearsden 16C | 102 Drymen Rd | K | Y | Y | 100% | N | N | 34.6 |
| Bearsden 17 | 106 Drymen Road | R | Y | N | 100% | N | N | 32.3 |
| Bearsden 18 | 3 Roman Road | R | Y | N | 100% | N | N | 33.3 |
| Bishopbriggs 12 | 24 Kirkintilloch Road | R | Y | N | 100% | N | N | 29.0 |
| Bishopbriggs 13 | 1495 Springburn Road | R | Y | N | 100% | N | N | 30.5 |
| Bishopbriggs 14 | 128 Kirkintilloch Road | R | Y | Y | 100% | N | N | 25.8 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Bishopbriggs 14B | 128 Kirkintilloch Road | R | Y | Y | 100% | N | N | 24.7 |
| Bishopbriggs 14C | 128 Kirkintilloch | R | Y | Y | 100% | N | N | 26.3 |
| Bishopbriggs 16 | 24 Kirkintilloch Road (Building Facade) | R | Y | N | 100% | N | N | 27.7 |
| Bishopbriggs 17 | 1495 Springburn Road (Building Facade) | R | Y | N | 100% | N | N | 32.3 |
| Bishopbriggs 18 | Beaufort Gardens | UB | N | N | 100% | N | N | 16.9 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Bishopbriggs 19 | 20 South Crosshill Road (Building façade) | R | N | N | 62% | N | N | 17.9* |
| Bishopbriggs 20 | 20 South Crosshill Road (lamp post outside) | R | N | N | 62% | N | N | 21.6* |
| Bishopbriggs 5 | Huntershill House | UB | N | N | 100% | N | N | 11.3 |
| Bishopbriggs 6 | 145 Kirkintilloch Road | R | Y | N | 100% | N | N | 25.0 |
| Kirkintilloch 15 | Lamp post R2 Townhead Lights | R | N | N | 100% | N | N | 31.3 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Kirkintilloch 16 | Parliament Rd | R | N | N | 100% | N | N | 32.6 |
| Kirkintilloch 17 | 1 Broomfield Walk | K | N | Y | 100% | N | N | 34.7 |
| Kirkintilloch 17B | 1 Broomfield Walk | K | N | Y | 100% | N | N | 35.6 |
| Kirkintilloch 17C | 1 Broomfield Walk | K | N | Y | 100% | N | N | 31.7 |
| Kirkintilloch 18 | Belmont Court | R | N | N | 100% | N | N | 26.4 |
| Milngavie 4 | Station Road | R | N | N | 92% | N | N | 23.0 |
| Milngavie 5 | Woodburn Way/ Park Road | R | N | N | 100% | N | N | 21.6 |
| Milngavie 6 | Park Road | R | N | N | 100% | N | N | 35.5 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (Number of Months or %) | Data with less than 9 months has been annualised (Y/N) | Confirm if data has been distance corrected (Y/N) | Annual mean concentration 2014 (µg/m$^3$) (Bias Adjustment factor = 0.90) |
|---|---|---|---|---|---|---|---|---|
| Milngavie 7 | 29 Southgate | R | N | N | 92% | N | N | 30.9 |
| Milngavie 8 | 6-12 Park Road | R | N | N | 100% | N | N | 24.7 |
| Milngavie 9 | Fairview Court | R | N | N | 92% | N | N | 24.4 |
| Milngavie 10 | Main Street | R | N | Y | 100% | N | N | 23.1 |
| Milngavie 10 B | Main Street | R | N | Y | 92% | N | N | 23.3 |
| Milngavie 10 C | Main Street | R | N | Y | 92% | N | N | 22.8 |

* Data has been annualised due to monitoring period following the method highlighted in Box 3.2 of TG (09)

**Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)**

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Bearsden 1 | R | Y | 30 | 33 | 32 | 42.5 | 36.7 | 34.3 | 29.9 | 28.8 |
| Bearsden 3 | UB | N | 19 | 17 | 23 | 22.7 | 23.8 | 20.9 | 18.6 | 18.5 |
| Bearsden 4 | UB | N | 10 | 14 | 15 | 15.9 | 14.8 | 11.4 | 11.4 | 11.4 |
| Bearsden 7 | R | Y | 43 | 48 | 42 | 46.6 | 39.6 | 39.1 | 34.4 | 31.0 |
| Bearsden 8 | R | Y | 38 | 38 | 40 | 40.4 | 35.4 | 32.2 | 34.6 | 33.4 |
| Bearsden 9 | R | N | 27 | 29 | 31 | 33 | 37.6 | 28.9 | 28.3 | 20.1 |
| Bearsden 10 | R | N | 34 | 33 | 31 | 35.6 | 37.7 | 27.2 | 28.9 | 26.1 |
| Bearsden 13 | R | Y | 37 | 39 | 38 | 43.7 | 43.2 | 37.5 | 37.6 | 35.2 |

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Bearsden 14 | R | Y | 39 | 38 | 39 | 43.5 | 43.8 | 33.1 | 35.3 | 30.2 |
| Bearsden 15 | R | Y | 34 | 40 | 38 | 39.8 | 42.1 | 37.2 | 38.2 | 27.6 |
| Bearsden 16 | K | Y | 40 | 46 | 40 | 45.5 | 40.8 | 38.8 | 38.9 | 33.9 |
| Bearsden 16B | K | Y | 41 | 45 | 39 | 46 | 46.3 | 38.8 | 38.9 | 34.5 |
| Bearsden 16C | K | Y | 39 | 43 | 40 | 48.3 | 44.2 | 38.8 | 38.9 | 34.6 |
| Bearsden 17 | R | Y | / | / | / | 42.2 | 38.6 | 39.7 | 39.6 | 32.3 |
| Bearsden 18 | R | Y | / | / | / | 38.6 | 35.3 | 30.8 | 33.9 | 33.3 |
| Bishopbriggs 5 | UB | N | 14 | 15 | 21 | 17.1 | 18.1 | 15.8 | 14.2 | 11.3 |

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Bishopbriggs 6 | R | Y | 37 | 37 | 36 | 42.7 | 37.6 | 30.5 | 28.3 | 25.0 |
| Bishopbriggs 8 | UB | N | 15 | 17 | 21 | 22.2 | 19.1 | - | - | - |
| Bishopbriggs 12 | R | Y | 34 | 40 | 40 | 46 | 40.5 | 37.3 | 30.7 | 29.0 |
| Bishopbriggs 13 | R | Y | 51 | 51 | 47 | 52.1 | 47 | 43.2 | 40.5 | 30.5 |
| Bishopbriggs 14 | R | Y | 30 | 31 | 33 | 34.4 | 34.4 | 29.4 | 28.3 | 25.8 |

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Bishopbriggs 14B | R | Y | 32 | 33 | 37 | 38.1 | 32.8 | 29.4 | 28.3 | 24.7 |
| Bishopbriggs 14C | R | Y | 29 | 32 | 33 | 38.2 | 35.9 | 29.4 | 28.3 | 26.3 |
| Bishopbriggs 16 | R | Y | / | / | / | 31.5 | 34.3 | 30.0 | 29.0 | 27.7 |
| Bishopbriggs 17 | R | Y | / | / | / | 37.8 | 37.3 | 35.6 | 35.5 | 32.3 |
| Bishopbriggs 18 | UB | N | / | / | / | / | / | 16.1 | 20.4 | 16.9 |

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m³ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Bishopbriggs 19 | R | N | / | / | / | / | / | / | / | 17.9 |
| Bishopbriggs 20 | R | N | / | / | / | / | / | / | / | 21.6 |
| Kirkintilloch 15 | R | N | 35 | 32 | 44 | 38.5 | 34.5 | 32.4 | 31.5 | 31.3 |
| Kirkintilloch 16 | R | N | 38 | 33 | 48 | 37.1 | 40.8 | 33.7 | 35.2 | 32.6 |
| Kirkintilloch 17 | K | N | / | 36 | 44 | 42.9 | 41.1 | 38.2 | 33.8 | 34.7 |
| Kirkintilloch 17B | K | N | / | 35 | 41 | 42.5 | 42.7 | 38.2 | 33.8 | 35.6 |
| Kirkintilloch 17C | K | N | / | 34 | 42 | 41.8 | 39.5 | 38.2 | 33.8 | 31.7 |

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m³ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Kirkintilloch 18 | R | N | / | / | / | 36.4* | 32.6 | 28.8 | 27.0 | 26.4 |
| Milngavie 4 | R | N | 26 | 29 | 30 | 31.5 | 33.5 | 27.6 | 25.9 | 23.0 |
| Milngavie 5 | R | N | 24 | 26 | 25 | 30.3 | 29.9 | 22.3 | 25.9 | 21.6 |
| Milngavie 6 | R | N | 40 | 42 | 36 | 41 | 41.2 | 39.9 | 34.8 | 35.5 |
| Milngavie 7 | R | N | / | / | 34 | 40.2 | 40.5 | 36.5 | 34.3 | 30.9 |
| Milngavie 8 | R | N | / | / | 27 | 30.3 | 28.3 | 24.1 | 26.3 | 24.7 |
| Milngavie 9 | R | N | / | / | 28 | 33.6 | 30.4 | 28.6 | 27.4 | 24.4 |
| Milngavie 10 | R | N | / | / | / | / | / | 25.9 | 25.2 | 23.1 |
| Milngavie 10 B | R | N | / | / | / | / | / | 25.9 | 25.2 | 23.3 |

| Site ID | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 | 2008 | 2009 (Bias Adjustment Factor = 1.20) | 2010* (Bias Adjustment Factor = 1.06) | 2011 (Bias Adjustment Factor = 1.17) | 2012 (Bias Adjustment Factor = 0.95) | 2013 (Bias Adjustment Factor = 0.98) | 2014 (Bias Adjustment Factor = 0.90) |
| Milngavie 10 C | R | N | / | / | / | / | / | 25.9 | 25.2 | 22.8 |

**Chart 2.2 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Urban Background Diffusion Tube Monitoring Sites**

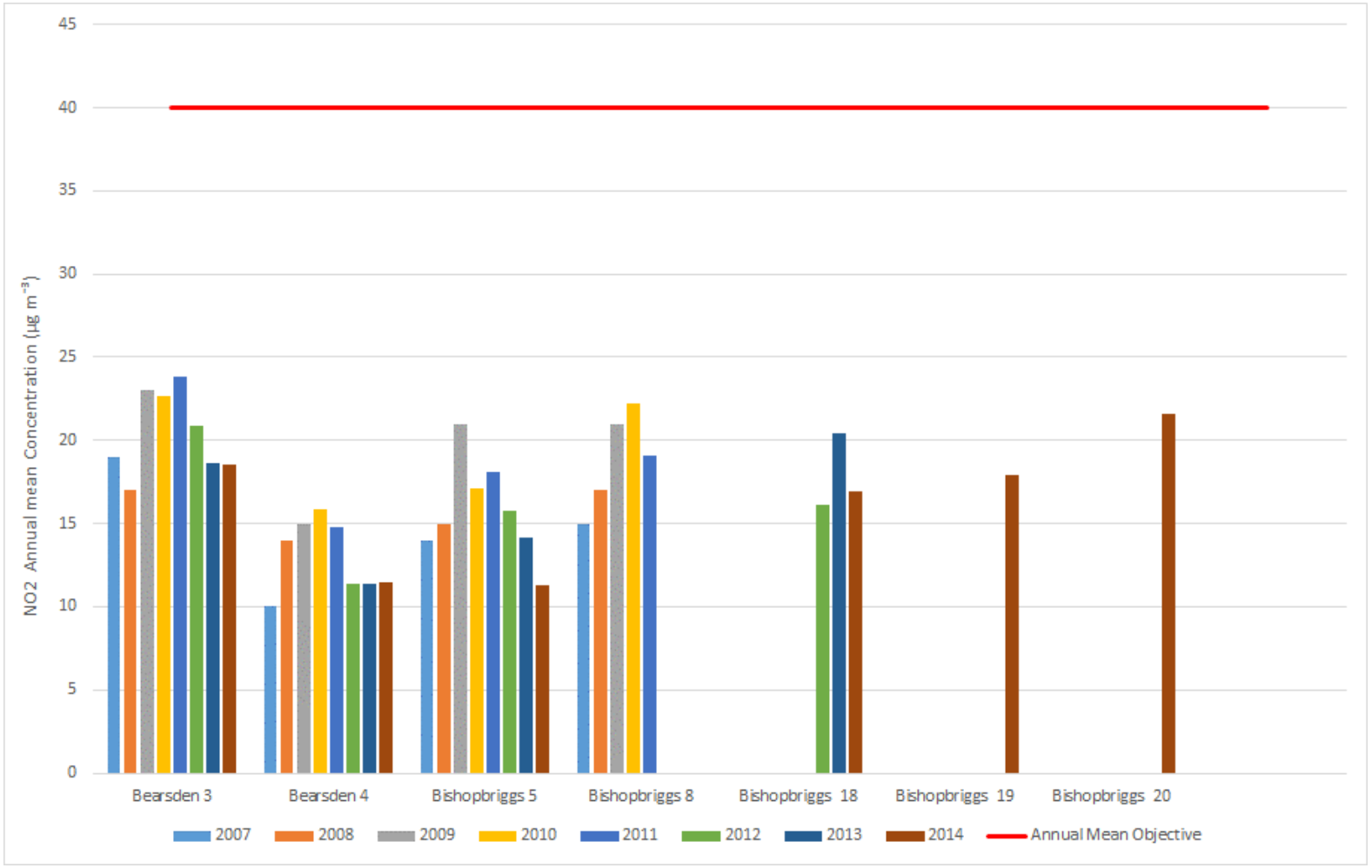


**Chart 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Roadside Diffusion Tube Monitoring Sites**

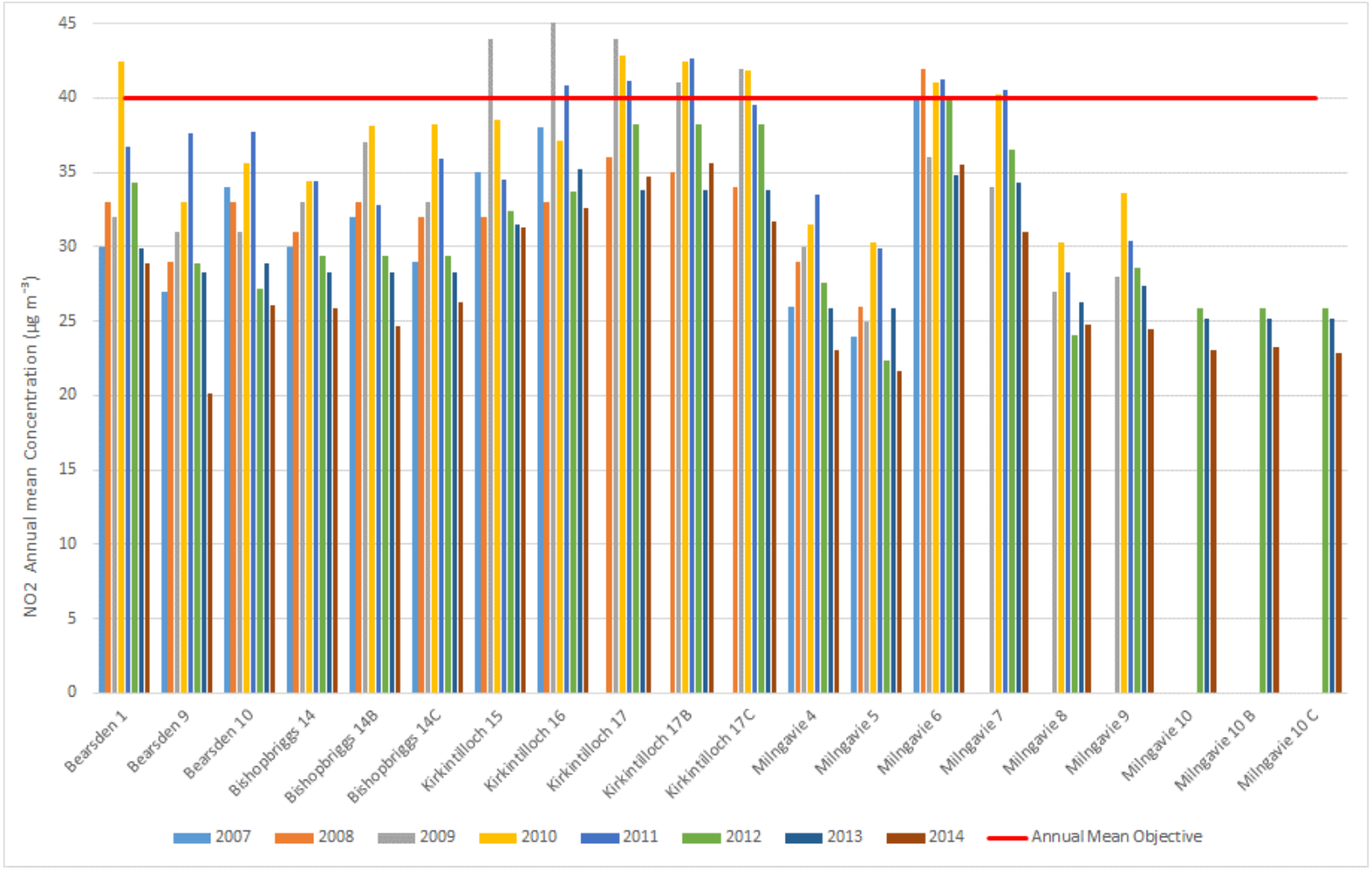
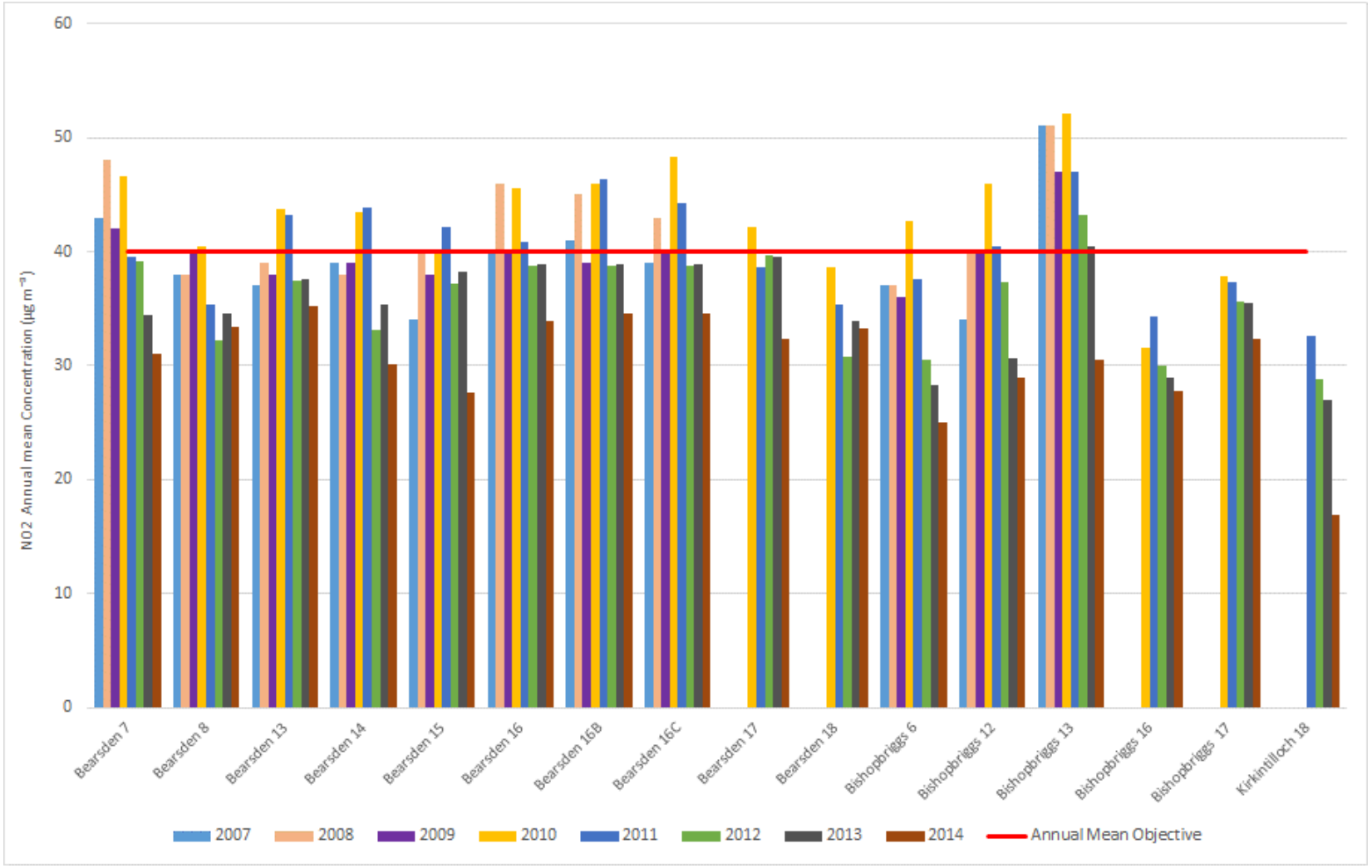


**Chart 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Kerbside Diffusion Tube Monitoring Sites**



## Diffusion Tube Monitoring Data

All of the diffusion tubes at Bishopbriggs, Bearsden, Kirkintilloch and Milngavie were below the 40 µg/m³ annual mean concentrations in 2014. All of the urban background and roadside diffusion tubes were below the 40 µg/m³ annual mean objective for 2014 with the lowest concentration of 11.3 µg/m³ recorded at Bishopbriggs 5 one of the urban background diffusion tubes which is located in Bishopbriggs. Charts 2.1, 2.2 and 2.3 show measured concentrations have significantly reduced since 2007 at all locations.

The 2014 bias adjustment factor used is slightly lower than the 2013 one. In addition, the bias adjustment factor used over the years since 2007 has decreased significantly. This should be taken into consideration when comparing the data between different years.

### 2.2.2 $PM_{10}$

#### Bearsden

The 2014 $PM_{10}$ annual mean was 14 µg/m³. The annual mean concentration over the previous two years of $PM_{10}$ were found to be erroneous after the Quality Control process carried out by Ricardo-AEA and could not be used for 2012 and 2013. The 2014 $PM_{10}$ annual concentration of 14 µg/m³ has fallen significantly since the high annual mean concentrations of 25 µg/m³ in 2010 and 20 µg/m³ in 2011.

The Partisol was installed in August 2013 to record $PM_{10}$ data at Milngavie Road, Bearsden, there is five months of data available for 2013 and the full calendar year for 2014 which can be seen in Annex D. This analyser is being used as an indicative monitoring study to ascertain the need for extending the Bearsden AQMA, the 2014 annual concentration and the mean of the 5 months of data available in 2013 are below the objective of 18 µg/m³. The 2014 annual mean concentration was 14µg/m³. Daily mean $PM_{10}$ concentrations in excess of 50 µg/m³ occurred on 1 day during 2014. This is within the seven permitted exceedances specified in the Scottish $PM_{10}$ objectives.

#### Bishopbriggs

The $PM_{10}$ data at Bishopbriggs shows that $PM_{10}$ fell consistently over the past 6 years from 21.1 µg/m³ in 2007 to an annual mean concentration of 15 µg/m³ in 2012. After the Quality Control process carried out by Ricardo-AEA, the $PM_{10}$ data at Bishopbriggs was found to be erroneous and could not be used for 2013. On the 3rd October 2014 the Bishopbriggs $PM_{10}$ analyser sustained a fault to the analyser's motherboard. This fault was deemed to be beyond economic repair and East Dunbartonshire Council are currently in the process of replacing the $PM_{10}$ analyser. The 2014 annual mean concentration was 14 µg/m³ which is below the $PM_{10}$ annual mean objective.

No exceedences of the $PM_{10}$ daily mean objective of 50 µg/m³ have been recorded in 2014.

#### Kirkintilloch

Kirkintilloch shows a clear downward trend in the three year period since the highest reading of 26 µg/m³, in 2010 and 17 µg/m³ for 2014.

Daily mean $PM_{10}$ concentrations in excess of 50 µg/m³ occurred on 2 days during 2014. This is within the seven permitted exceedances specified in the Scottish $PM_{10}$ objectives.

### Milngavie

The 2014 $PM_{10}$ annual mean was 14 µg/m³ and is below the annual mean objective of 18 µg/m³. No exceedences of the $PM_{10}$ daily mean objective of 50 µg/m³ have been recorded in 2014.

**Table 2.7 Results of Automatic Monitoring of $PM_{10}$: Comparison with Annual Mean Objective**

| Site ID | Site Type | Within AQMA? | Valid Data Capture for monitoring Period % | Valid Data Capture 2014 % | Confirm Gravimetric Equivalent (Y or NA) | Annual Mean Concentration µg/m³ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| Bearsden | Kerbside | Y | 98 | 98 | Y | 20.6 | 22.8 | 20.5 | 25 | 20 | - | - | 14 |
| Bishopbriggs | Roadside | Y | 68 | 68 | Y | 21.1 | 17.8 | 18.9 | 19 | 17 | 15 | - | 14* |
| Kirkintilloch | Kerbside | N | 92 | 92 | Y | 23.7 | 22 | 22.5 | 26 | 19 | 18 | 17 | 17 |
| Milngavie | Roadside | N | 92 | 92 | Y | - | - | - | - | 16* | 14 | 14 | 14 |

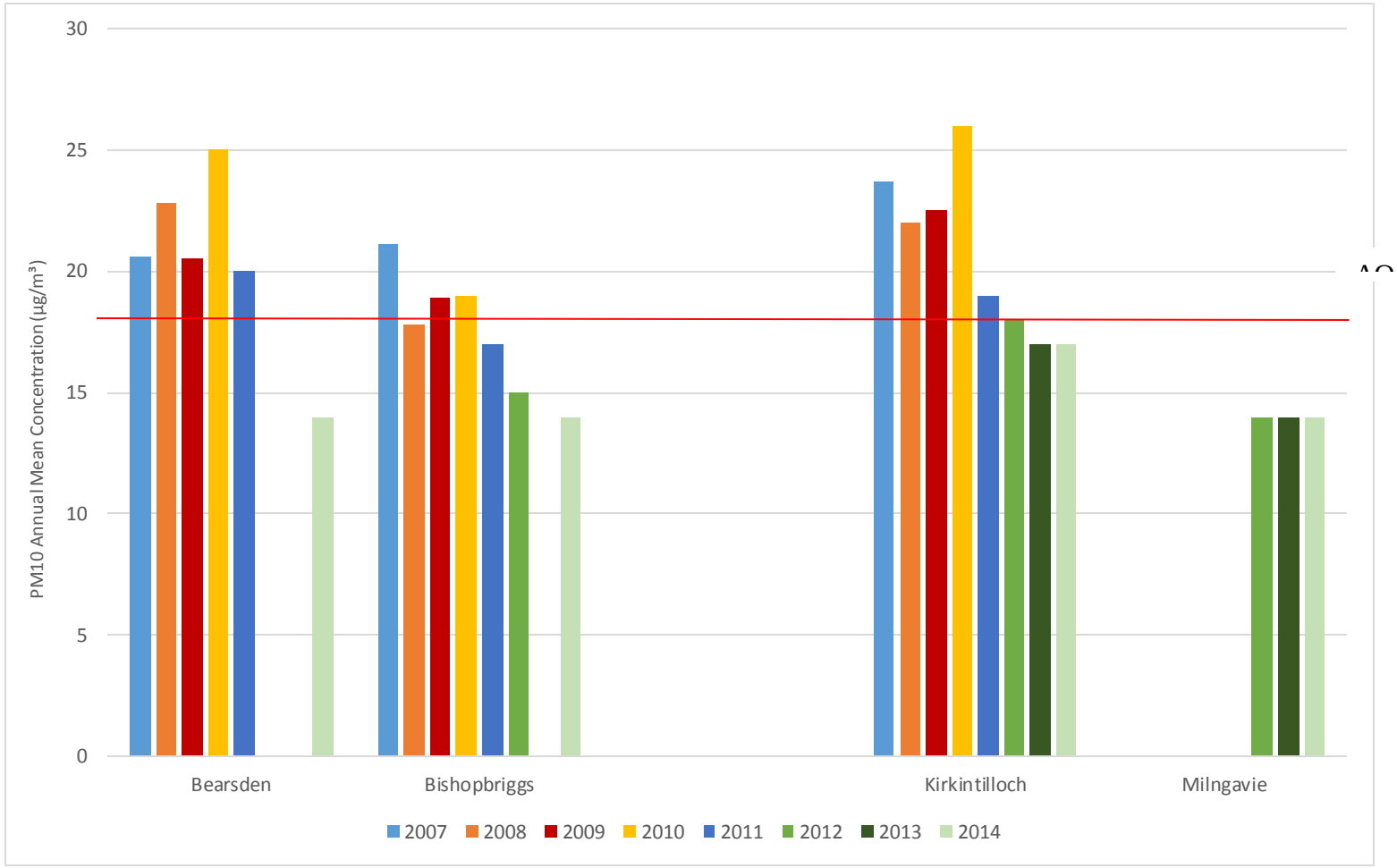
* Data has been annualised due to monitoring period following the method highlighted in Box 3.2 of TG (09)

**Table 2.8 Results of Automatic Monitoring for $PM_{10}$: Comparison with 24-hour mean Objective**

| Site ID | Site Type | Within AQMA? | Valid Data Capture for monitoring Period % | Valid Data Capture 2014 % | Confirm Gravimetric Equivalent | Number of Exceedences of 24-Hour Mean 50 µg/m³ not to be breached >7 times per year | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| Bearsden | Kerbside | Y | 98 | 98 | Y | 3 | 5 | 5 | 20 | 3 | 0 | 0 | 1 |
| Bishopbriggs | Roadside | Y | 68 | 68 | Y | 6 | 4 | 5 | 11 | 2 | 0 | 0 | 0 (33) |
| Kirkintilloch | Kerbside | N | 92 | 92 | Y | 3 | 6 | 15 | 21 | 6 | 0 | 3 | 2 |
| Milngavie | Roadside | N | 92 | 92 | Y | - | - | - | - | 1 (36) | 0 | 0 | 0 |

*data capture is less than 90%, the 98.08th percentile of 24-hour means are included in brackets

**Chart 2.5 Trends in the annual mean concentrations of $PM_{10}$ data for the four fixed air monitors in East Dunbartonshire Council between 2007 and 2014**



The measured annual mean $PM_{10}$ concentrations during 2014 indicate that $PM_{10}$ concentrations at the four East Dunbartonshire monitoring sites were below the annual mean objective. Also the number of measured exceedences of the daily mean objective for $PM_{10}$ did not breach the number of permitted exceedances.

### 2.2.3 Sulphur Dioxide

East Dunbartonshire Council does not currently monitor SO2. Historical monitoring data indicated a decline in concentration in line with those experienced across the UK. Concentrations measured from 1992 to 2005 were significantly below objective levels for SO2.

### 2.2.4 Benzene

East Dunbartonshire Council does not currently monitor Benzene

### 2.2.5 Other pollutants monitored

East Dunbartonshire Council does not undertake monitoring of any other pollutants.

### 2.2.6 Summary of Compliance with AQS Objectives

The air quality at all fixed monitoring stations and diffusion tubes complied with the $NO_2$ and $PM_{10}$ objectives in 2014.

East Dunbartonshire Council has examined the results from monitoring in the district. Concentrations outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

# 3 Road Traffic Sources

The Council Roads Services Department have advised that there were no new or significantly changed road traffic sources, as per the screening criteria, that have not been previously assessed. It was therefore concluded that there have been no significant changes to emissions from traffic sources within the Council area since the 2011 Updating and Screening Assessment.

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

East Dunbartonshire 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

East Dunbartonshire 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.

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

## 3.4 Junctions

East Dunbartonshire 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

East Dunbartonshire Council confirms that there are no new/proposed roads.

## 3.6 Roads with Significantly Changed Traffic Flows

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

## 3.7 Bus and Coach Stations

East Dunbartonshire Council confirms that there are no relevant bus stations in the Local Authority area.

# 4 Other Transport Sources

There have been no newly identified emissions from rail, shipping or aircraft operations within the Council area since the 2014 Progress Report.

## 4.1 Airports

East Dunbartonshire Council confirms that there are no airports in the Local Authority area.

## 4.2 Railways (Diesel and Steam Trains)

### 4.2.1 Stationary Trains

East Dunbartonshire 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

The Edinburgh to Glasgow line, which has a large number of diesel locomotives, passes through Bishopbriggs. Although there is relevant exposure within 30m at some locations, the background annual mean $NO_2$ concentration is not greater than 25 µg/m$^3$ and therefore there is no requirement to proceed to a Detailed Assessment.

**East Dunbartonshire 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)

East Dunbartonshire 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

The Scottish Environment Protection Agency (SEPA) were contacted to determine if there have been any new or significantly changed industrial processes in the area which may impact on air quality.

East Dunbartonshire 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

East Dunbartonshire 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

East Dunbartonshire 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 East Dunbartonshire Council area.

## 5.3 Petrol Stations

East Dunbartonshire Council confirms that there are no petrol stations meeting the specified criteria.

## 5.4 Poultry Farms

East Dunbartonshire Council confirms that there are no poultry farms meeting the specified criteria.

# 6 Commercial and Domestic Sources

## 6.1 Biomass Combustion – Individual Installations

East Dunbartonshire Council Planning Services were consulted with regards to any new or changed commercial and domestic sources. No new commercial biomass combustion sources were identified. No new areas of domestic fuel burning were identified.

East Dunbartonshire Council confirms that there are no biomass combustion plant in the Local Authority area.

## 6.2 Biomass Combustion – Combined Impacts

East Dunbartonshire Council confirms that there are no biomass combustion plant in the Local Authority area.

## 6.3 Domestic Solid-Fuel Burning

The Council was granted £608,538 for investment in Energy Efficiency Measures in 2014/2015 through the Scottish Government's Home Energy Efficiency Programme for Scotland (HEEPS). The investment, which is targeted at fuel poor households across Scotland, will be used for the installation of energy efficiency measures such as solid wall, cavity and loft insulation.

The bulk of Council housing stock now have energy efficient gas central heating boilers.

The majority of urban areas within EDC are smoke control areas however there has been an increase in the number of residents expressing an interest in installing wood burning stoves.

East Dunbartonshire Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

# 7 Fugitive or Uncontrolled Sources

The Scottish Environment Protection Agency (SEPA) were consulted in relation to any changed waste, landfill or quarry processes identified in the public registers. There have been no significant changes to existing process emissions and no new fugitive sources identified.

East Dunbartonshire Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

# 8 Conclusions and Proposed Actions

## 8.1 Conclusions from New Monitoring Data

Measured annual mean concentrations of $NO_2$ and $PM_{10}$ at Bearsden, Bishopbriggs, Kirkintilloch and Milngavie in 2014 all met the air quality objectives.

An AQMA will continue to be in place in Bishopbriggs and Bearsden.

In Bearsden an additional Partisol 2025 to measure $PM_{10}$ was installed just outside the AQMA area to give an indicative idea of whether the $PM_{10}$ emissions are elevated in that area, and whether the AQMA would have to be extended. The measured concentrations for 2014 and for the 5 months of 2013 since it was installed in August 2013 show that the levels are well below the annual mean objective.

## 8.2 Conclusions from Assessment of Sources

No new local developments were identified for which there was a need to proceed to a Detailed Assessment.

## 8.3 Proposed Actions

The next LAQM requirement for the Council will be to submit a Progress Report in 2016.

In 2015 a decision will be made as to whether an AQMA in Kirkintilloch will require to be declared based on the Detailed Assessment (December 2013) and the most up to date data.

The downward trend in data over the past 3 years is a strong indicator that the construction of the Kirkintilloch Link Road contributed to elevated levels of $NO_2$ and $PM_{10}$ over the construction period until the new road opened in November 2010.

Due to the Bishopbriggs Town Centre Development being granted on appeal, it has been agreed with the Scottish Government to postpone further monitoring and modelling to establish

whether the Bishopbriggs AQMA can be revoked until such time as the development is complete as traffic patterns will alter.

The Bishopbriggs AQMA will therefore continue for a number of years to ascertain whether the proposed development in the vicinity will have an impact on air quality.

The Bishopbriggs Relief Road Phase III is due to open forthwith. Traffic will be monitored regularly for some time. The opening of the road will alter traffic flows through Bishopbriggs AQMA.

A replacement $PM_{10}$ Analyser will need to be acquired and installed to replace the faulty Beta-attenuation monitor (BAM).

East Dunbartonshire Council will make a decision on whether continue to measure $PM_{10}$ with the partisol analyser at Milngavie Road, Bearsden as the 2013 and 2014 annual concentration was below the 18 µg/m$^3$ objective.

# Appendices

Appendix A: Location Maps

Appendix B: QA/QC Data

Appendix C: PPC Part A and Part B

Appendix D: Partisol Data

Appendix A: Location Maps

Figure A.1 Map of East Dunbartonshire Council boundary

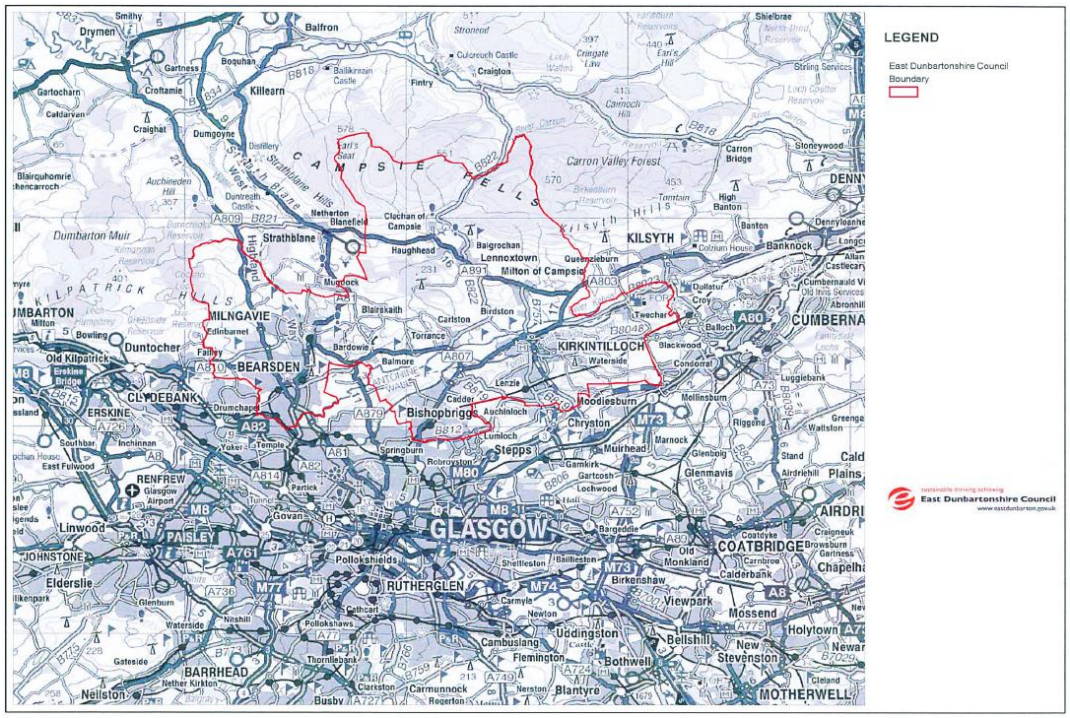



Figure A.2 Map of Monitoring Locations at Bearsden

Figure A.3 Map of Monitoring Locations at Bishopbriggs

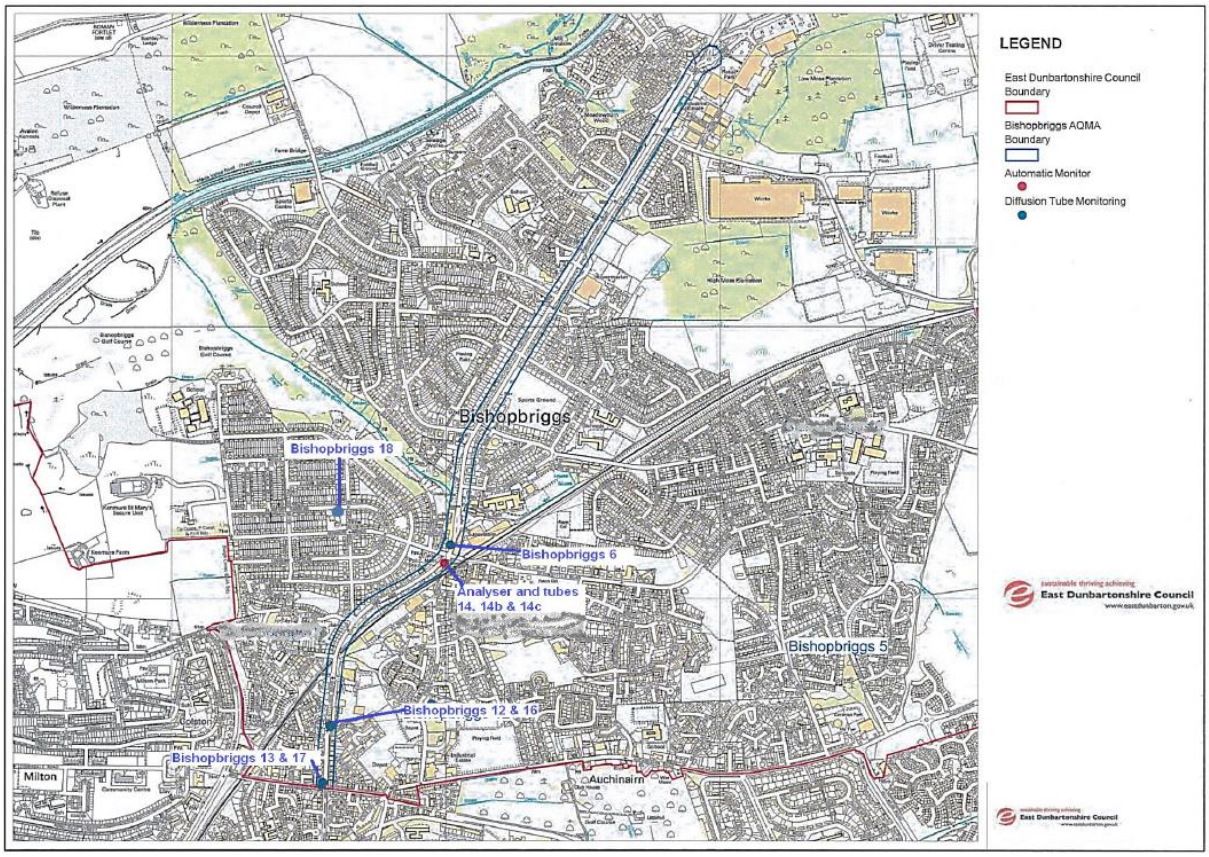



Figure A.4 Map of Monitoring Locations at Kirkintilloch

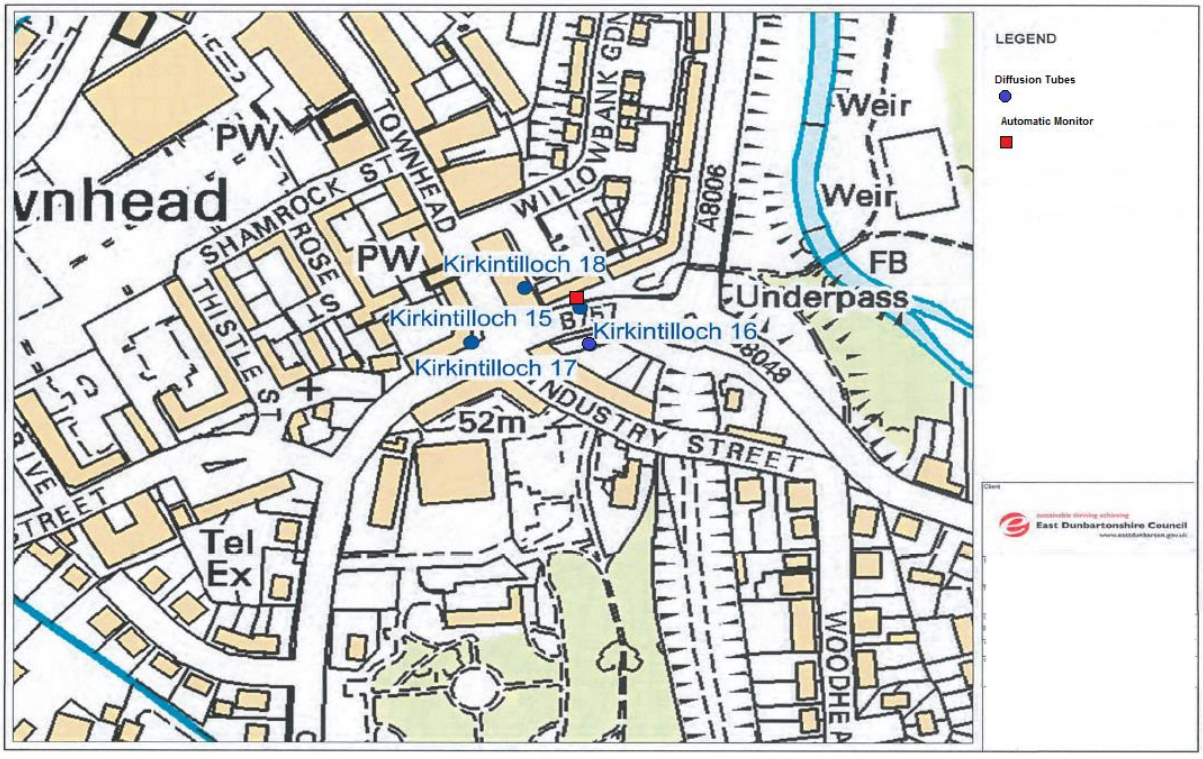


Figure A.5 Map of Monitoring Locations at Milngavie

Appendix B: QA/QC Data

## Factor from Local Co-location Studies

The laboratory analysis of the passive diffusion tubes used by the Council is undertaken by Glasgow Scientific Services. Glasgow Scientific Services is a UKAS accredited laboratory with documented Quality Assurance/Quality Control (QA/QC) procedures for diffusion tube analysis. The laboratory prepares the diffusion tubes using the 20% triethanolamine (TEA) in water method.

Glasgow Scientific Services public analyst participates in the AEA inter-comparison scheme, with bias correction factors calculated and applied annually. The laboratory analyses results from co-location studies at various locations.

The laboratory co-location factors are presented in Table A.1.

Figure B.1 Glasgow Scientific Services – National average bias adjustment factor

**National Diffusion Tube Bias Adjustment Factor Spreadsheet** — Spreadsheet Version Number: 06/15

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of September 2015

LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

**Step 1:** Select the Laboratory that Analyses Your Tubes from the Drop-Down List. If a laboratory is not shown, we have no data for this laboratory.

**Step 2:** Select a Preparation Method from the Drop-Down List. If a preparation method is not shown, we have no data for this method at this laboratory.

**Step 3:** Select a Year from the Drop-Down List. If a year is not shown, we have no data[2]

**Step 4:** Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in **blue** at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

| Analysed By[1] | Method (To undo your selection, choose (All) from the pop-up list) | Year[2] (To undo your selection, choose (All)) | Site Type | Local Authority | Length of Study (months) | Diffusion Tube Mean Conc. (Dm) (µg/m³) | Automatic Monitor Mean Conc. (Cm) (µg/m³) | Bias (B) | Tube Precision[4] | Bias Adjustment Factor (A) (Cm/Dm) |
|---|---|---|---|---|---|---|---|---|---|---|
| Glasgow Scientific Services | 20% TEA in water | 2014 | KS | Glasgow City Council | 10 | 75 | 65 | 14.6% | P | 0.87 |
| Glasgow Scientific Services | 20% TEA in water | 2014 | KS | Marylebone Road Intercomparison | 12 | 101 | 80 | 26.4% | G | 0.79 |
| Glasgow Scientific Services | 20% TEA in water | 2014 | | **Overall Factor[3] (2 studies)** | | | | **Use** | | 0.83 |

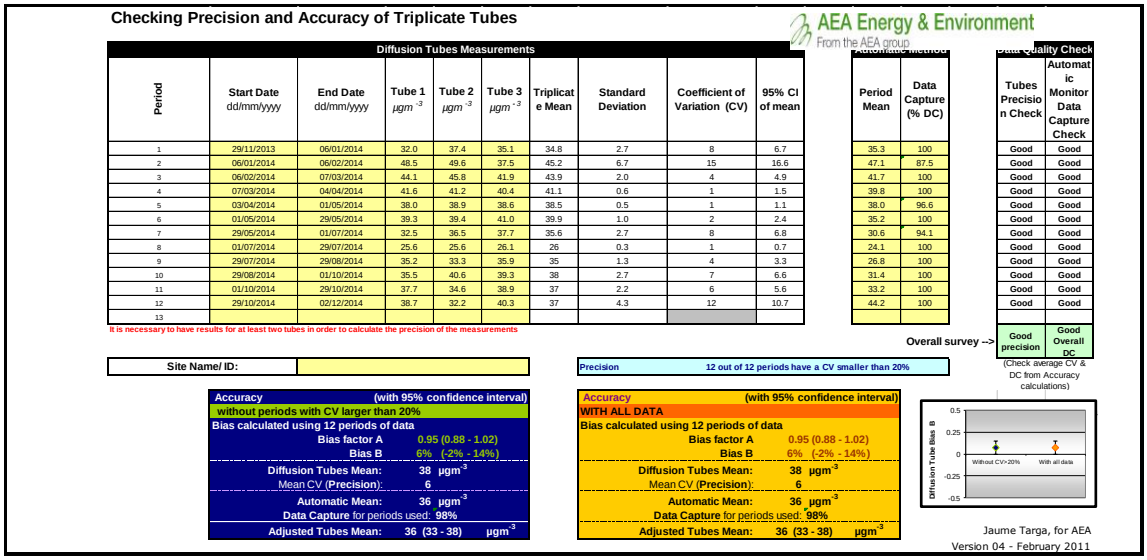
*Diffusion_Tube_Bias_Factors-v06_15

## Diffusion Tube Bias Adjustment Factors

## Co-Located Bias Adjustment Co-location Factors

The data for the four co-location studies carried out by East Dunbartonshire Council were put into the Ricardo-AEA bias adjustment spread sheet and the results are presented in Table B.1.

## Figure B.2: Co-location study – Bearsden



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 | 29/11/2013 | 06/01/2014 | 32.0 | 37.4 | 35.1 | 34.8 | 2.7 | 8 | 6.7 |
| 2 | 06/01/2014 | 06/02/2014 | 48.5 | 49.6 | 37.5 | 45.2 | 6.7 | 15 | 16.6 |
| 3 | 06/02/2014 | 07/03/2014 | 44.1 | 45.8 | 41.9 | 43.9 | 2.0 | 4 | 4.9 |
| 4 | 07/03/2014 | 04/04/2014 | 41.6 | 41.2 | 40.4 | 41.1 | 0.6 | 1 | 1.5 |
| 5 | 03/04/2014 | 01/05/2014 | 38.0 | 38.9 | 38.6 | 38.5 | 0.5 | 1 | 1.1 |
| 6 | 01/05/2014 | 29/05/2014 | 39.3 | 39.4 | 41.0 | 39.9 | 1.0 | 2 | 2.4 |
| 7 | 29/05/2014 | 01/07/2014 | 32.5 | 36.5 | 37.7 | 35.6 | 2.7 | 8 | 6.8 |
| 8 | 01/07/2014 | 29/07/2014 | 25.6 | 25.6 | 26.1 | 26 | 0.3 | 1 | 0.7 |
| 9 | 29/07/2014 | 29/08/2014 | 35.2 | 33.3 | 35.9 | 35 | 1.3 | 4 | 3.3 |
| 10 | 29/08/2014 | 01/10/2014 | 35.5 | 40.6 | 39.3 | 38 | 2.7 | 7 | 6.6 |
| 11 | 01/10/2014 | 29/10/2014 | 37.7 | 34.6 | 38.9 | 37 | 2.2 | 6 | 5.6 |
| 12 | 29/10/2014 | 02/12/2014 | 38.7 | 32.2 | 40.3 | 37 | 4.3 | 12 | 10.7 |
| 13 | | | | | | | | | |

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

| Period Mean | Data Capture (% DC) |
|---|---|
| 35.3 | 100 |
| 47.1 | 87.5 |
| 41.7 | 100 |
| 39.8 | 100 |
| 38.0 | 96.6 |
| 35.2 | 100 |
| 30.6 | 94.1 |
| 24.1 | 100 |
| 26.8 | 100 |
| 31.4 | 100 |
| 33.2 | 100 |
| 44.2 | 100 |

| Tubes Precision Check | Automatic Monitor Data Capture Check |
|---|---|
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| | |
| Good precision | Good Overall DC |

Overall survey -->

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

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

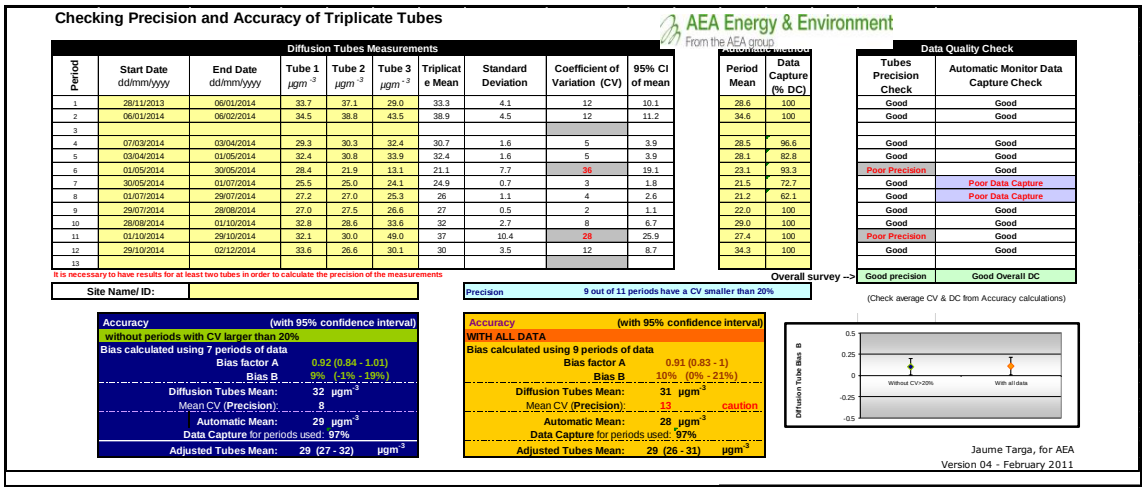
Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A: 0.95 (0.88 - 1.02)
Bias B: 6% (-2% - 14%)
Diffusion Tubes Mean: 38 µgm$^{-3}$
Mean CV (Precision): 6
Automatic Mean: 36 µgm$^{-3}$
Data Capture for periods used: 98%
Adjusted Tubes Mean: 36 (33 - 38) µgm$^{-3}$

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A: 0.95 (0.88 - 1.02)
Bias B: 6% (-2% - 14%)
Diffusion Tubes Mean: 38 µgm$^{-3}$
Mean CV (Precision): 6
Automatic Mean: 36 µgm$^{-3}$
Data Capture for periods used: 98%
Adjusted Tubes Mean: 36 (33 - 38) µgm$^{-3}$



Jaume Targa, for AEA
Version 04 - February 2011

## Figure B.3 Co-location study – Bishopbriggs



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 | 28/11/2013 | 06/01/2014 | 33.7 | 37.1 | 29.0 | 33.3 | 4.1 | 12 | 10.1 |
| 2 | 06/01/2014 | 06/02/2014 | 34.5 | 38.8 | 43.5 | 38.9 | 4.5 | 12 | 11.2 |
| 3 | | | | | | | | | |
| 4 | 07/03/2014 | 03/04/2014 | 29.3 | 30.3 | 32.4 | 30.7 | 1.6 | 5 | 3.9 |
| 5 | 03/04/2014 | 01/05/2014 | 32.4 | 30.8 | 33.9 | 32.4 | 1.6 | 5 | 3.9 |
| 6 | 01/05/2014 | 30/05/2014 | 28.4 | 21.9 | 13.1 | 21.1 | 7.7 | 36 | 19.1 |
| 7 | 30/05/2014 | 01/07/2014 | 25.5 | 25.0 | 24.1 | 24.9 | 0.7 | 3 | 1.8 |
| 8 | 01/07/2014 | 29/07/2014 | 27.2 | 27.0 | 25.3 | 26 | 1.1 | 4 | 2.6 |
| 9 | 29/07/2014 | 28/08/2014 | 27.0 | 27.5 | 26.6 | 27 | 0.5 | 2 | 1.1 |
| 10 | 28/08/2014 | 01/10/2014 | 32.8 | 28.6 | 33.6 | 32 | 2.7 | 8 | 6.7 |
| 11 | 01/10/2014 | 29/10/2014 | 32.1 | 30.0 | 49.0 | 37 | 10.4 | 28 | 25.9 |
| 12 | 29/10/2014 | 02/12/2014 | 33.6 | 26.6 | 30.1 | 30 | 3.5 | 12 | 8.7 |
| 13 | | | | | | | | | |

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

| Period Mean | Data Capture (% DC) |
|---|---|
| 28.6 | 100 |
| 34.6 | 100 |
| | |
| 28.5 | 96.6 |
| 28.1 | 82.8 |
| 23.1 | 93.3 |
| 21.5 | 72.7 |
| 21.2 | 62.1 |
| 22.0 | 100 |
| 29.0 | 100 |
| 27.4 | 100 |
| 34.3 | 100 |
| | |

| Tubes Precision Check | Automatic Monitor Data Capture Check |
|---|---|
| Good | Good |
| Good | Good |
| | |
| Good | Good |
| Good | Good |
| Poor Precision | Good |
| Good | Poor Data Capture |
| Good | Poor Data Capture |
| Good | Good |
| Good | Good |
| Poor Precision | Good |
| Good | Good |
| | |
| Good precision | Good Overall DC |

Overall survey -->

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 9 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 7 periods of data
Bias factor A: 0.92 (0.84 - 1.01)
Bias B: 9% (-1% - 19%)
Diffusion Tubes Mean: 32 µgm$^{-3}$
Mean CV (Precision): 8
Automatic Mean: 29 µgm$^{-3}$
Data Capture for periods used: 97%
Adjusted Tubes Mean: 29 (27 - 32) µgm$^{-3}$

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 9 periods of data
Bias factor A: 0.91 (0.83 - 1)
Bias B: 10% (0% - 21%)
Diffusion Tubes Mean: 31 µgm$^{-3}$
Mean CV (Precision): 13 caution
Automatic Mean: 28 µgm$^{-3}$
Data Capture for periods used: 97%
Adjusted Tubes Mean: 29 (26 - 31) µgm$^{-3}$



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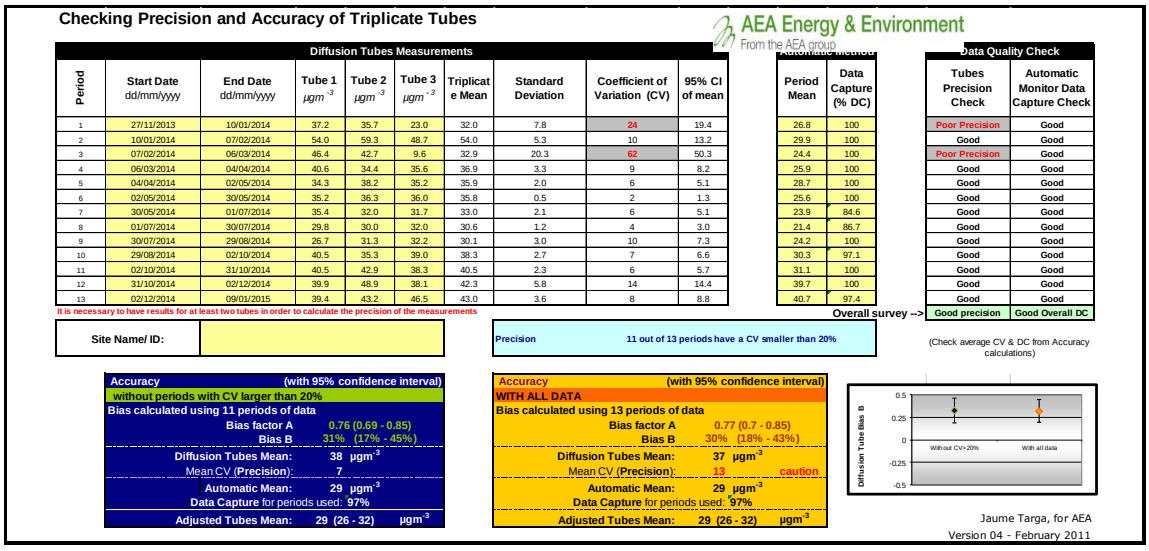
## Figure B.4 Co-location study – Kirkintilloch



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 | 27/11/2013 | 10/01/2014 | 37.2 | 35.7 | 23.0 | 32.0 | 7.8 | 24 | 19.4 |
| 2 | 10/01/2014 | 07/02/2014 | 54.0 | 59.3 | 48.7 | 54.0 | 5.3 | 10 | 13.2 |
| 3 | 07/02/2014 | 06/03/2014 | 46.4 | 42.7 | 9.6 | 32.9 | 20.3 | 62 | 50.3 |
| 4 | 06/03/2014 | 04/04/2014 | 40.6 | 34.4 | 35.6 | 36.9 | 3.3 | 9 | 8.2 |
| 5 | 04/04/2014 | 02/05/2014 | 34.3 | 38.2 | 35.2 | 35.9 | 2.0 | 6 | 5.1 |
| 6 | 02/05/2014 | 30/05/2014 | 35.2 | 36.3 | 36.0 | 35.8 | 0.5 | 2 | 1.3 |
| 7 | 30/05/2014 | 01/07/2014 | 35.4 | 32.0 | 31.7 | 33.0 | 2.1 | 6 | 5.1 |
| 8 | 01/07/2014 | 30/07/2014 | 29.8 | 30.0 | 32.0 | 30.6 | 1.2 | 4 | 3.0 |
| 9 | 30/07/2014 | 29/08/2014 | 26.7 | 31.3 | 32.2 | 30.1 | 3.0 | 10 | 7.3 |
| 10 | 29/08/2014 | 02/10/2014 | 40.5 | 35.3 | 39.0 | 38.3 | 2.7 | 7 | 6.6 |
| 11 | 02/10/2014 | 31/10/2014 | 40.5 | 42.9 | 38.3 | 40.5 | 2.3 | 6 | 5.7 |
| 12 | 31/10/2014 | 02/12/2014 | 39.9 | 48.9 | 38.1 | 42.3 | 5.8 | 14 | 14.4 |
| 13 | 02/12/2014 | 09/01/2015 | 39.4 | 43.2 | 46.5 | 43.0 | 3.6 | 8 | 8.8 |

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

| Automatic Method | |
|---|---|
| Period Mean | Data Capture (% DC) |
| 26.8 | 100 |
| 29.9 | 100 |
| 24.4 | 100 |
| 25.9 | 100 |
| 28.7 | 100 |
| 25.6 | 100 |
| 23.9 | 84.6 |
| 21.4 | 86.7 |
| 24.2 | 100 |
| 30.3 | 97.1 |
| 31.1 | 100 |
| 39.7 | 100 |
| 40.7 | 97.4 |
| Overall survey --> | |

Data Quality Check

| Tubes Precision Check | Automatic Monitor Data Capture Check |
|---|---|
| Poor Precision | Good |
| Good | Good |
| Poor Precision | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good precision | Good Overall DC |

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 11 out of 13 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A: 0.76 (0.69 - 0.85)
Bias B: 31% (17% - 45%)
Diffusion Tubes Mean: 38 µgm⁻³
Mean CV (Precision): 7
Automatic Mean: 29 µgm⁻³
Data Capture for periods used: 97%
Adjusted Tubes Mean: 29 (26 - 32) µgm⁻³

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 13 periods of data
Bias factor A: 0.77 (0.7 - 0.85)
Bias B: 30% (18% - 43%)
Diffusion Tubes Mean: 37 µgm⁻³
Mean CV (Precision): 13 caution
Automatic Mean: 29 µgm⁻³
Data Capture for periods used: 97%
Adjusted Tubes Mean: 29 (26 - 32) µgm⁻³

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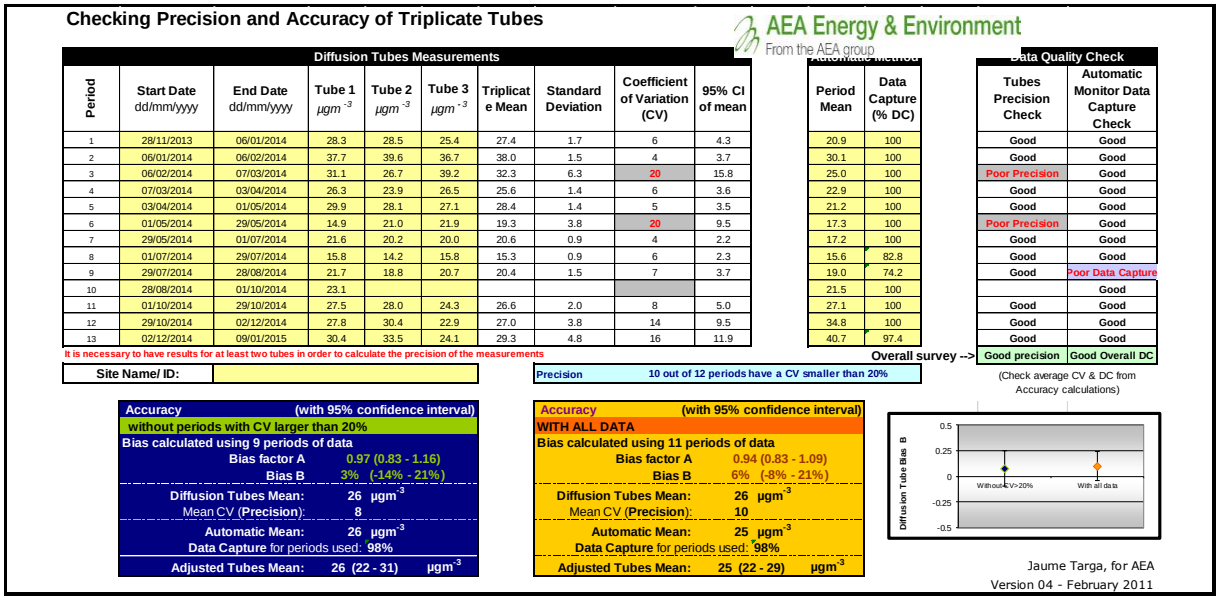
Version 04 - February 2011

## Figure B.5 Co-location study – Milngavie



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 | 28/11/2013 | 06/01/2014 | 28.3 | 28.5 | 25.4 | 27.4 | 1.7 | 6 | 4.3 |
| 2 | 06/01/2014 | 06/02/2014 | 37.7 | 39.6 | 36.7 | 38.0 | 1.5 | 4 | 3.7 |
| 3 | 06/02/2014 | 07/03/2014 | 31.1 | 26.7 | 39.2 | 32.3 | 6.3 | 20 | 15.8 |
| 4 | 07/03/2014 | 03/04/2014 | 26.3 | 23.9 | 26.5 | 25.6 | 1.4 | 6 | 3.6 |
| 5 | 03/04/2014 | 01/05/2014 | 29.9 | 28.1 | 27.1 | 28.4 | 1.4 | 5 | 3.5 |
| 6 | 01/05/2014 | 29/05/2014 | 14.9 | 21.0 | 21.9 | 19.3 | 3.8 | 20 | 9.5 |
| 7 | 29/05/2014 | 01/07/2014 | 21.6 | 20.2 | 20.0 | 20.6 | 0.9 | 4 | 2.2 |
| 8 | 01/07/2014 | 29/07/2014 | 15.8 | 14.2 | 15.8 | 15.3 | 0.9 | 6 | 2.3 |
| 9 | 29/07/2014 | 28/08/2014 | 21.7 | 18.8 | 20.7 | 20.4 | 1.5 | 7 | 3.7 |
| 10 | 28/08/2014 | 01/10/2014 | 23.1 | | | | | | |
| 11 | 01/10/2014 | 29/10/2014 | 27.5 | 28.0 | 24.3 | 26.6 | 2.0 | 8 | 5.0 |
| 12 | 29/10/2014 | 02/12/2014 | 27.8 | 30.4 | 22.9 | 27.0 | 3.8 | 14 | 9.5 |
| 13 | 02/12/2014 | 09/01/2015 | 30.4 | 33.5 | 24.1 | 29.3 | 4.8 | 16 | 11.9 |

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

| Automatic Method | |
|---|---|
| Period Mean | Data Capture (% DC) |
| 20.9 | 100 |
| 30.1 | 100 |
| 25.0 | 100 |
| 22.9 | 100 |
| 21.2 | 100 |
| 17.3 | 100 |
| 17.2 | 100 |
| 15.6 | 82.8 |
| 19.0 | 74.2 |
| 21.5 | 100 |
| 27.1 | 100 |
| 34.8 | 100 |
| 40.7 | 97.4 |
| Overall survey --> | |

Data Quality Check

| Tubes Precision Check | Automatic Monitor Data Capture Check |
|---|---|
| Good | Good |
| Good | Good |
| Poor Precision | Good |
| Good | Good |
| Good | Good |
| Poor Precision | Good |
| Good | Good |
| Good | Good |
| Good | Poor Data Capture |
| | Good |
| Good | Good |
| Good | Good |
| Good | Good |
| Good precision | Good Overall DC |

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 10 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 9 periods of data
Bias factor A: 0.97 (0.83 - 1.16)
Bias B: 3% (-14% - 21%)
Diffusion Tubes Mean: 26 µgm⁻³
Mean CV (Precision): 8
Automatic Mean: 26 µgm⁻³
Data Capture for periods used: 98%
Adjusted Tubes Mean: 26 (22 - 31) µgm⁻³

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A: 0.94 (0.83 - 1.09)
Bias B: 6% (-8% - 21%)
Diffusion Tubes Mean: 26 µgm⁻³
Mean CV (Precision): 10
Automatic Mean: 25 µgm⁻³
Data Capture for periods used: 98%
Adjusted Tubes Mean: 25 (22 - 29) µgm⁻³




Jaume Targa, for AEA
Version 04 - February 2011

Table B.1 Factor from Local Co-location Studies

| Site Name | Study duration | Tube precision | Bias correction Factor |
|---|---|---|---|
| Bearsden | 13 | Good | 0.95 |
| Bishopbriggs | 13 | Good | 0.91 |
| Kirkintilloch | 13 | Good | 0.76 |
| Milngavie | 13 | Good | 0.97 |
| Average factor from the co-location studies | | | 0.90 |

## Discussion of Choice of Factor to Use

The Council have chosen to use the local bias adjustment factor. The laboratory bias adjustment factor is made up of results from two monitoring studies undertaken by Glasgow City Council. It was felt that using the local adjustment factor was more appropriate as historically the local bias factor have always been used. This factor is slightly higher than the national adjustment factor so it will provide a worst case of the $NO_2$ concentrations within the Council area.

## PM Monitoring Adjustment

East Dunbartonshire Council monitor $PM_{10}$ using three types of analyser:

- Beta-attenuation monitor (BAM) – Eberline (Eb);
- Tapered Element Oscillating Microbalance (TEOM) with a Filter Dynamics Measurement System(FDMS); and
- Partisol gravimetric analyser.

The beta attenuation analysers are maintained by Horiba and undergo regular calibration. The TEOM (FDMS) is maintained by Air Monitors Ltd. The gravimetric analyser was provided by Casella ETI and the filters are analysed by Glasgow Scientific Services which is a UKAS accredited laboratory.

The beta-attenuation monitors (BAMs) used by East Dunbartonshire Council have a heated inlet which has been found to cause evaporation of some semi-volatile particles thereby reducing the measured $PM_{10}$ concentration. All data have been provided ratified and gravimetric equivalent by Ricardo-AEA.

The TEOM FDMS is equivalent to the European Reference Sampler and the results are therefore fully comparable to the AQS objectives, with no need for adjustment.

Short-term to Long-term Data Adjustment

Two Diffusion tube locations were added the East Dunbartonshire Council's tube network in May. As a late addition to 2014's monitoring the data capture for both Bishopbriggs 19 and Bishopbriggs 20 was 62%. A short to long term data adjustment was applied to annual mean $NO_2$ measurements where the data capture was less than 75%.

Table B.2 Short-Term to Long-Term Monitoring Data Adjustment – Bishopbriggs 19 and 20 $NO_2$

| Long term site | Annual Mean | Period Mean | Ratio (Am/Pm) |
|---|---|---|---|
| Glasgow Townhead | 27.10 | 26.36 | 1.028 |
| Bush Estate | 6.65 | 6.27 | 1.061 |
| Peebles | 6.07 | 5.60 | 1.083 |
| Eskdalemuir | 2.29 | 1.90 | 1.208 |
| | | Average Ratio | 1.095 |

Due to a fault with the Motherboard of the Beta-attenuation monitor (BAM) analyser at Bishopbriggs. Erroneous data was deleted and the analyser was switched off from the 3rd October 2014. The analyser was deemed to beyond economic repair and East

Dunbartonshire Council are currently looking at replacing the analyser. Due to this fault the data capture for $PM_{10}$ at Bishopbriggs was 68%.

Table B.3 Short-Term to Long-Term Monitoring Data Adjustment – Bishopbriggs $PM_{10}$

| | Annual Mean (Am) | Period Mean (Pm) | Ratio (Am / Pm) |
|---|---|---|---|
| Perth Muriton | 10 | 9 | 1.108 |
| Glasgow Townhead | 13 | 14 | 0.936 |
| Auchencorth Moss | 8 | 6 | 1.266 |
| | | Average (Ratio) | 1.103 |

## QA/QC of Automatic Monitoring

Quality Assurance/Quality Control (QA/QC) audits are carried out by Ricardo-AEA twice a year, whereby monitoring data are managed to the same procedures and standards as AURN sites.

## QA/QC of Diffusion Tube Monitoring

All passive diffusion tubes (PDT) for $NO_2$ measurement were prepared and analysed by Edinburgh Scientific Services. The PDTs were prepared using the 50% triethanolamine (TEA) in water method.

Glasgow Scientific Services is a UKAS accredited laboratory with documented Quality Assurance/Quality Control (QA/QC) procedures for diffusion tube analysis.

Glasgow Scientific Services participates in the HSL WASP $NO_2$ PT rounds and the percentage (%) of results submitted which were subsequently determined to be satisfactory during the previous five rounds in 2011 and 2012 based upon a z-score of $< \pm 2$ were as follows:

Figure B.6 Laboratory summary performance for WASP $NO_2$ PT Rounds 121-124 and AIR $NO_2$ PT rounds AR001, 3, 4 and 6

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent WASP/AIR $NO_2$ PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of $\leq \pm 2$ as defined above.

| **WASP Round** | **WASP R121** | **WASP R122** | **WASP R123** | **WASP R124** | **AIR PT AR001** | **AIR PT AR003** | **AIR PT AR004** | **AIR PT AR006** |
|---|---|---|---|---|---|---|---|---|
| **Round conducted in the period** | April – June 2013 | July – September 2013 | October – December 2013 | January – March 2014 | April – May 2014 | July – August 2014 | October – November 2014 | January – February 2015 |
| Glasgow Scientific Services | 25 % | 100 % | 100 % | 100 % | 100 % | 100 % | 100 % | 100 % |

[1] Participant subscribed to two sets of test samples (2 x 4 test samples) in each WASP/AIR PT round.
[2] NR No results reported
[3] Kent Scientific Services, Cardiff Scientific Services and Exova (formerly Clyde Analytical) no longer carry out NO2 diffusion tube monitoring and therefore did not submit results.

# Appendix C: PPC Part A and Part B

### Part A

PW Hall, Woodilee Ind Estate, Kirkintilloch

### Part B (standard)

Aggregate Industries, Kirkintilloch Readymix Plant, Torrance

Archibald Young Ltd, Milton Road, Kirkintilloch

Carrickstone Rock Co Ltd Mobile Plant

Cemex Cumbernauld Readymix, Gartshore, Twechar

Cemex Roadstone Coating Plant, Gartshore, Twechar

Ferrymill Motors, Campsie Road, Torrance

Guala Closures UK Ltd, Broomhill Ind Est, Kirkintilloch

Guala Closures UK Ltd, Old Mill Park Ind Est, Kirkintilloch

John McGavigan Ltd, 111 Westerhill Road, Bishopbriggs

Marley Eternit Ltd, Cadder, Bishopbriggs

Robeslee Concrete Co Ltd, Southbank Road, Kirkintilloch George Beattie & Sons – Mobile Plant, although base is in Auchinvole, Twechar

### Part B (Dry Cleaners)

Bearsden Dry Cleaners, 1 Canniesburn Toll, Bearsden

Cross Court Cleaners, 8 The Cross Court, Bishopbriggs

Dry Clean Depot Ltd, Unit 12 ,Baljafray Shopping Centre, Grampian Way, Bearsden

Johnson Cleaners UK Ltd, 10-12 Station Road, Milngavie

Johnson Cleaners UK Ltd, 73 Cowgate, Kirkintilloch

The Dry Cleaning Company, Block 17C Unit 2, Old Mill Park Industrial Estate, Kirkintilloch

### Part B (Petrol Vapour Recovery)

ASDA, Milngavie Road, Bearsden

Bearsden Filling Station, Duntocher Road, Bearsden

BP Canniesburn Connect Service Station, Maryhill Road, Bearsden

BP Services, Milngavie Road, Bearsden

Hillfoot Auto Supplies, 145 Milngavie Road, Bearsden

Kirkie Filling Station, Waterside Road, Kirkintilloch

Lennox Service Station, Main Street, Lennoxtown

Malthust Fuel, 42 Glasgow Road, Milngavie

N&S Motors, Boghead Road, Lenzie

Shell Low Moss Filling Station, Kirkintilloch Road, Bishopbriggs

Shell Westermains FS, Glasgow Road, Kirkintilloch

# Appendix D: Partisol Data

The Partisol was installed in August 2013 to record $PM_{10}$ data at Milngavie Road, Bearsden as an indicative monitoring study to ascertain the need for extending the Bearsden AQMA. There is five months of data available for 2013 and a full calendar year for 2014, the annual $PM_{10}$ concentrations for both years were below the objective of 18 µg/m³. Although April 2014 and November 2014 the monthly concentrations were just above the annual objective of 18 µg/m³, the annual average was below the objective.

Figure D.1 Annual Average $PM_{10}$ Mass Concentration (µg/m³) for Bearsden, Milngavie Road Partisol

| Monthly Average | Mass Concentration (µg/m³) |
|---|---|
| 2013 | 12.66 |
| 2014 | 13.62 |

Figure D.2 Monthly Average $PM_{10}$ Mass Concentration (µg/m³) for Bearsden, Milngavie Road Partisol

| Monthly Average | Mass Concentration (µg/m³) |
|---|---|
| Aug-13 | 10.78 |
| Sep-13 | 11.92 |
| Oct-13 | 12.17 |

| | |
|---|---|
| Nov-13 | 16.53 |
| Dec-13 | 11.92 |
| 2013 AVERAGE | 12.66 |
| Jan-14 | 11.81 |
| Feb-14 | 10.92 |
| Mar-14 | 15.08 |
| Apr-14 | 18.56 |
| May-14 | 13.56 |
| Jun-14 | 9.00 |
| Jul-14 | 10.30 |
| Aug-14 | 9.54 |
| Sep-14 | 17.41 |
| Oct-14 | 12.62 |
| Nov-14 | 18.15 |
| Dec-14 | 17.26 |
| 2014 AVERAGE | 13.62 |

Chart D.1 Monthly Average $PM_{10}$ Mass Concentration (µg/m³) for Bearsden, Milngavie Road Partisol