



2011 Air Quality Progress Report for **ARGYLL AND BUTE COUNCIL**

In fulfillment of Part IV of the Environment
Act 1995

Local Air Quality Management

April 2011

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| Date | 20 April 2011 |

Executive Summary

The continuing work to assess local air quality within Argyll and Bute Council has established that there is no requirement to progress to a Detailed Assessment for any pollutants and that:-

- (a) Diffusion tube results indicate that the 2004 annual mean objective for nitrogen dioxide (NO₂) continues to be met
- (b) Compliance with 2010 fine particulates (PM₁₀) 24 hour mean and annual mean objectives has been achieved
- (c) The results from the two Streetbox monitors in Port Ellen indicate that the 2003 carbon monoxide (CO) objective is being met.

A review of planning applications submitted in 2010 did not reveal any developments with the potential to significantly affect local air quality. There were no new permitted processes opened in 2010 with the capacity to affect local air quality. No new landfill sites or quarries opened with relevant public exposure.

Conclusions

1. There is no requirement for Argyll and Bute Council to progress to Detailed Assessment. In the course of our work we have :-
 - a. Identified this position through objective monitoring
 - b. Worked with businesses to improve their awareness of local air quality. Of significant note is the conclusion of the project to provide new higher flues at Port Ellen Maltings which has assisted in improving air quality and addressed substantial issues of smoke pollution

The Council has reviewed its local air quality monitoring programme and proposes to decommission its monitors at Tarbert and Port Ellen when the next service of the instruments is due in summer 2011.

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1 Introduction

1.1 Description of Local Authority Area

The Argyll and Bute Council area covers approximately 6900 square kilometres and borders upon Stirling, Highland, West Dunbartonshire, and Perth and Kinross Councils. Much of the land area is occupied by mountain and moorland, particularly in the north eastern portion. Off the coastline lie some 550 islands, 25 of which are inhabited. The principal islands are Bute, Islay, Mull, Luing, Jura, Coll, Lismore, Iona, Colonsay and Gigha, and the main settlements are located at Bowmore, Campbeltown, Dunoon, Lochgilphead, Oban, Rothesay, Tobermory, Tarbert, Inveraray and Helensburgh.

The combination of mountain, moorland, coastline, particularly the long indented sea lochs, as well as several large fresh water lochs, give the area a distinctive character. The designations of several National and Regional Scenic Areas and the Loch Lomond and the Trossachs National Park reflect this.

Industries

Industries tend to be related to the natural assets of the area. Forestry and agriculture are prevalent inland, whilst in coastal areas there are a large number of distilleries, fish farms, boat building and fishing businesses. Tourism makes a significant and important contribution to the Argyll and Bute economy.

Those industries that are regulated by the Scottish Environmental Protection Agency (SEPA) because of their potential to cause pollution i.e. prescribed processes in terms of the Pollution Prevention & Control (Scotland) Regulations 2000, are mapped in Appendix C.

Population

The population of the area was recorded in the 2001 census as 91306. Appendix C indicates the distribution of the population in the major settlements.

Road Network and Transport

The topography of the area, together with the relatively dispersed population, means that the majority of transport movements involve long road journeys. Most of the main roads follow the coastline and have to make long detours around the head of extensive sea lochs. The only large towns served by the rail network are Oban and Helensburgh. Throughout the area heavy reliance is therefore placed upon road transport, both by the resident population and visitors. Between 1995 and 1997, 82% of the 1.8 million trips made into the Argyll, the Isles, Loch Lomond, Stirling and the Trossachs Tourist Board area were made by road transport. Summertime traffic flows are consequently much higher than those experienced during the winter months.

Regular car ferry services connect the larger islands and there are numerous smaller car and passenger ferries serving the smaller islands. In addition, ferry services operate between mainland settlements for commuter, freight and tourist traffic, for example Dunoon to Gourock. The main ferry terminals are located at Dunoon, Oban, Rothesay and Kennacraig.

Airports operating scheduled flights between island and mainland communities are found at Coll, Colonsay, Tiree, Campbeltown, Islay and Oban.

A map showing the location of ferry terminals and airports is included in Appendix C.

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 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 microgrammes per cubic metre, $\mu\text{g}/\text{m}^3$ (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 Scotland.

| Pollutant | Concentration | Measured as | Date to be achieved by |
|--|---|---------------------|------------------------|
| Benzene | 16.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2003 |
| | 3.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2010 |
| 1,3-Butadiene | 2.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2003 |
| Carbon monoxide | 10.0 mg/m^3 | Running 8-hour mean | 31.12.2003 |
| Lead | 0.5 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2004 |
| | 0.25 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2008 |
| Nitrogen dioxide | 200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year | 1-hour mean | 31.12.2005 |
| | 40 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2005 |
| Particles (PM₁₀) (gravimetric) | 50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year | 24-hour mean | 31.12.2004 |
| | 50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 7 times a year | 24-hour mean | 31.12.2010 |
| | 40 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2004 |
| | 18 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2010 |
| Sulphur dioxide | 350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year | 1-hour mean | 31.12.2004 |
| | 125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year | 24-hour mean | 31.12.2004 |
| | 266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year | 15-minute mean | 31.12.2005 |

1.4 Summary of Previous Review and Assessments

Table 1.2 Summary of Previous Reports.

| Report | Date | Outcome |
|--|-------------|--|
| First Stage Assessment | 1998 | Further assessment of NO ₂ & SO ₂ required |
| Second Stage Assessment (USA) | 2003 | Detailed assessments required for PM ₁₀ and SO ₂ in relation to the combustion of solid fuel in Tarbert. Further assessment recommended for Port Ellen Maltings. |
| Detailed Assessment – PM ₁₀ & SO ₂ from solid fuel combustion in Tarbert | 2005 | Indicated compliance with PM ₁₀ & SO ₂ objectives. |
| Further Assessment for industrial process at Port Ellen | 2005 | Recommended monitoring for CO at Port Ellen |
| Progress Report | 2005 | Recommended monitoring for CO at Port Ellen |
| Updating & Screening Assessment | 2006 | Continue monitoring PM ₁₀ related to solid fuel combustion at Tarbert and detailed assessment for CO at Port Ellen Maltings |
| Progress Report & Detailed Assessment | 2007 | Detailed assessment reported Port Ellen Maltings should comply with CO objective. |
| Progress Report | 2008 | Continued monitoring indicates compliance with CO & PM ₁₀ objectives |
| Updating & Screening Assessment | 2009 | Continued monitoring indicates compliance with CO & PM ₁₀ objectives |
| Progress Report | 2010 | Continued monitoring indicates compliance with CO & PM ₁₀ objectives |

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Table 2.1 provides details of automatic monitoring sites within Argyll and Bute. All three sites were originally established to support Detailed Assessments undertaken to further consider the pollutants monitored. The conclusion of the Detailed Assessments^{2,8} was that designation of Air Quality Management areas was not necessary although it was decided to maintain the operation of the three automatic monitoring sites. Details of QA/QC procedures are included in Appendix A.

Table 2.1 Details of Automatic Monitoring Sites

| Site Name | Site Type | OS Grid Ref | Pollutants Monitored | Monitoring Technique | In AQMA? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road | Worst-case Location? |
|--------------------------|------------------|----------------------|-----------------------------|-----------------------------|-----------------|--|---|-----------------------------|
| Tarbert | Urban background | E 186553 N 668458 | PM ₁₀ | TEOM | N | Y (23m) | N/A | Y |
| Port Ellen – Antrim View | Urban background | E 135970 N 645880 | CO | Streetbox | N | Y (12m) | N/A | Y |
| Port Ellen – Bay View | Urban background | E 135970 N 645880 | CO | Streetbox | N | Y (22m) | N/A | Y |

2.1.2 Non-Automatic Monitoring Sites

Argyll and Bute Council undertakes monitoring of nitrogen dioxide using diffusion tubes at 10 sites throughout the district, mainly on roads which are perceived to be subject to the highest concentrations due to traffic flow and possibly associated with other features such as street canyons. Details of current sites are provided in Table 2.2 and QA/QC procedures are included in Appendix A.

Following a review of NO₂ diffusion tube monitoring sites in May 2010 it was concluded that the tube sited in Cardross was not in a representative position and was moved to be closer to a sensitive receptor in the village. The tube at Tarbet had fulfilled its purpose in confirming low concentrations and that it was deemed to be beneficial to resite it to Sinclair Street, Helensburgh which is a relatively heavily trafficked street canyon and contains sensitive residential receptors.

Table 2.2 Details of Non- Automatic Monitoring Sites

| Site Name | Site Type | OS Grid Ref | Pollutants Monitored | In AQMA? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road | Worst-case Location? |
|------------------------------|------------------|----------------------|-----------------------------|-----------------|--|---|-----------------------------|
| George Street 1, Oban | Roadside | E 185920 N 729942 | NO ₂ | N | Y (5m) | 2m | Y |
| George Street 2, Oban | Roadside | E 185870 N 730319 | NO ₂ | N | Y (4m) | 9m | Y |
| George Street 3, Oban | Roadside | E 185880 N 730250 | NO ₂ | N | Y (4m) | 9m | Y |
| Argyll Street, Dunoon | Roadside | E 217324 N 676894 | NO ₂ | N | Y(6m) | 3 | Y |
| Main St, Campbeltown | Roadside | E 171918 N 620330 | NO ₂ | N | Y(1m) | 3 | Y |
| Colchester Sq, Lochgilphead | Roadside | E 186222 N 687940 | NO ₂ | N | Y(10m) | 2 | N |
| Inverneil | Rural B'ground | E 186048 N 729293 | NO ₂ | N | Y(3m) | N/A | Y |
| East Princes St, Helensburgh | Roadside | E 229809 N 682326 | NO ₂ | N | Y(12m) | 2 | N |
| Main Road, Cardross | Roadside | E 234350 N 677771 | NO ₂ | N | Y(6m) | 2 | Y |
| Sinclair Street Helensburgh | Roadside | E 231925 N 704478 | NO ₂ | N | Y(3m) | 2 | Y |

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Diffusion Tube Monitoring Data

The annual mean concentrations for NO₂ diffusion tubes (adjusted for bias) are presented in Table 2.3. A monthly breakdown of results is included in Appendix B. The last 3 years' annual mean results are shown in Table 2.4 and also in graphical format in Appendix B.

Table 2.3 Results of Nitrogen Dioxide Diffusion Tubes

| Location | Within AQM A? | Data Capture 2010 % | Data Capture Monitoring Period % | Annual mean concentrations |
|------------------------------|---------------|---------------------|----------------------------------|---|
| | | | | 2010 (µg/m ³) Adjusted for bias |
| George Street 1, Oban | N | 100 | n/a | 26 |
| George Street 2, Oban | N | 92 | n/a | 25 |
| George Street 3, Oban | N | 100 | n/a | 28 |
| Argyll Street, Dunoon | N | 75 | n/a | 18 |
| Main St, Campbeltown | N | 92 | n/a | 22 |
| Colchester Sq, Lochgilphead | N | 92 | n/a | 9 |
| Inverneil | N | 92 | n/a | 3 |
| East Princes St, Helensburgh | N | 100 | n/a | 19 |
| Main Road, Cardross | N | 58 | 100 | 20(Annualised) |
| Sinclair Street, Helensburgh | N | 58 | 100 | 22(Annualised) |

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

| Location | Within AQMA? | Annual mean concentrations (µg/m ³) Adjusted for bias | | |
|---|--------------|---|------|------|
| | | 2008 | 2009 | 2010 |
| George Street 1, Oban | N | 28 | 30 | 26 |
| George Street 2, Oban | N | n/a | 25 | 25 |
| George Street 3, Oban | N | n/a | 30 | 28 |
| Argyll Street, Dunoon | N | 17 | 19 | 18 |
| Main St, Campbeltown | N | 22 | 26 | 22 |
| Colchester Sq, Lochgilphead | N | 9 | 12 | 9 |
| Inverneil | N | 2 | 3 | 3 |
| East Princes St, Helensburgh | N | 20 | 24 | 19 |
| Main Road, Cardross | N | 18 | 21 | 20 |
| Sinclair Street, Helensburgh | N | n/a | n/a | 22 |
| Bias adjustment factor used (2010 from Spreadsheet 04/11) | | 0.97 | 1.23 | 1.10 |

An examination of the results obtained from established diffusion tubes does not reveal any significant trends at any sites.

2.2.2 PM₁₀

A TEOM PM₁₀ monitor was sited at Tarbert Academy following the conclusion of the 2003 USA¹ to progress to a Detailed Assessment in respect of domestic solid fuel combustion. The site is surrounded by housing with many properties burning solid fuel as a primary source of heating and is considered to be representative of relevant public exposure. It was reported in the 2007 Progress Report and Detailed Assessment² that there would be compliance with all the 2004 and 2010 objectives. Monitoring of PM₁₀ using the TEOM has continued at the site.

The Volatile Correction Model cannot be used for the TEOM monitoring data as there are no FDMS instruments with sufficient data capture within range. The results presented below have been corrected by using the equation *Reference equivalent PM₁₀ = TEOM x 1.3 – 2.2494* as directed by the UK Air Quality Archive⁶. Annual means and 24 hour exceedances are presented in graphical form in Appendix B and Tables 2.5 and 2.6 below

A distinct downward trend is apparent from an examination of the results of the Tarbert TEOM. A significant influence may be the conversion of primary heating in houses on the scheme in the vicinity of the monitor from burning coal to electric power.

Table 2.5 Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

| Location | Within AQMA? | Data Capture for monitoring period ^a % | Data Capture for full calendar year 2010 % | Annual mean concentrations (µg/m ³) | | |
|----------|--------------|--|---|---|------|------|
| | | | | 2008 | 2009 | 2010 |
| Tarbert | N | n/a | 99 | 16.9 | 14.3 | 13.8 |

Note: 2008 data annualised as per Box 3.2 of TG(09)

Table 2.6 Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

| Location | Within AQMA? | Data Capture 2010 % | Number of exceedances of daily mean objective (50 µg/m ³) | | |
|----------|--------------|------------------------|---|------|------|
| | | | 2008 | 2009 | 2010 |
| Tarbert | N | 99 | 0 | 0 | 0 |

2.2.3 Carbon Monoxide

The 2006 USA³ concluded that there was a possibility that the NAQS objective for carbon monoxide (CO) could be exceeded in the vicinity of the Maltings, Port Ellen, Islay. The process at the Maltings prepares malted barley for use at island distilleries. The malted barley is dried in kilns which are fired by medium fuel oil and the primary air to the burners is supplemented by smoke from burning peat with the intention of flavouring the product. Two kilns may be in operation at any one time. Modelling exercises undertaken following the 2003 USA suggested that the carbon monoxide produced by the burning peat could cause an exceedance of the NAQS objective at residential property close to the process.

Two Streetbox monitors were installed in 2006 at Port Ellen to provide continuous indicative monitoring of CO. These were attached to street furniture near to residential properties on Bay View and Antrim View. These sites were identified from the 2005 report⁴ which had indicated maximum concentrations of CO would be found at these locations.

Streetbox monitors contain electrochemical cells and are regarded as suitable for use as a screening tool by LAQM.TG(09)⁵. Data is collected by the Streetbox in units of parts per million v/v and the periodic mean logged at 15 minute intervals. The data from both monitors is presented graphically in Appendix B and numerically in Table 2.7.



Table 2.7 Results of carbon monoxide monitoring at Port Ellen

| Site | Objective Exceeded? (8 hour mean = 10mg/m ³) | Highest 8 hourly mean mg/m ³ | | | | |
|-------------|---|---|------|------|------|------|
| | | 2006 | 2007 | 2008 | 2009 | 2010 |
| Antrim View | No | 1.5 | 2.1 | 3.4 | 1.9 | 1.5 |
| Bay View | No | 8.5 | 8.0 | 4.5 | 6.7 | 6.9 |

Following the 2007 Detailed Assessment² Diageo plc installed cowls on the three kiln discharge stacks in August 2007 which tripled the discharge velocity from 5.5 to 16.5 m/s. The building effects on plume behaviour were still evident and the decision was made by the plant operator, Diageo plc, to replace the low level chimneys with 39m

high stainless steel stacks. Construction was completed in summer 2010 and the dispersion of the plume has been greatly improved, successfully removing the tendency for grounding to regularly occur in the area of Bay View/Antrim View housing schemes. The photograph above shows the new stacks and much improved plume dispersion.

Unfortunately, problems with both Streetbox monitors following installation of the new stacks did not allow an assessment of CO concentrations in the latter half of 2010. However, measurements undertaken in early 2011 have reflected the expected significant reduction and will be reported more fully in the 2012 USA.

2.2.4 Summary of Compliance with AQS Objectives

Argyll and Bute Council has examined the results from monitoring in its area. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Commercial and Domestic Sources

The installation of small/medium sized biomass boilers is becoming an increasingly attractive alternative to oil and coal, particularly in areas where gas is not available as an option. A leaflet has been produced to help developers deal with their obligations under the Clean Air Act to supplement other guidance which deals primarily with the planning regime.

The following installations were granted planning permission since the publication of the 2010 Progress Report:

- Drimsynie House Hotel, Lochgoilhead – 350kW Woodchip fired boiler
- Hunters Quay Caravan Park, Sandbank, Dunoon– 350kW Woodchip fired boiler

3.2 New Developments with Fugitive or Uncontrolled Sources

There are numerous haul roads associated with forestry extraction that are of a temporary nature and not hard surfaced. These roads are invariably remote, inherently damp and do not threaten to cause breaches of PM₁₀ objectives. The Council does not propose to carry out individual assessments of these sources unless particular circumstances indicate that it would be appropriate.

Argyll and Bute Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

Planning permission has been received for biomass boiler installations at

Drimsynie House Hotel, Lochgoilhead
Hunters Quay Caravan Park, Sandbank, Dunoon

These will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

4 Planning Applications

Planning permission in principle has been granted for a biomass power station on the Cowal Peninsula near to Portavadie. The development is subject to conditions that require assessment of emissions to air before construction commences.

5 Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

Indicative monitoring of PM₁₀ and carbon monoxide has continued at sites previously the subject of Detailed Assessments. There is no indication that any objectives have been exceeded in 2010.

The nitrogen dioxide diffusion tube network has continued in operation and reference to the graphs in Appendix B show that no significant trends have been revealed or that any measured concentrations are close to the annual mean objective.

5.2 Conclusions relating to New Local Developments

Further consideration will be given to new biomass plant in the 2012 Updating and Screening Assessment. None of the installations described in this report give rise for the need to undertake a Detailed Assessment.

5.3 Proposed Actions

The 2011 Progress Report has not identified any need to proceed to a Detailed Assessment for any pollutant.

A review of the Council's air monitoring strategy for PM₁₀ and carbon monoxide considered that the aims of the exercise had been fulfilled satisfactorily. Furthermore the conditions that prompted progression to earlier Detailed Assessments at Tarbert and Port Ellen no longer existed and would be very unlikely to recur. It has been proposed that monitoring of PM₁₀ at Tarbert and carbon monoxide at Port Ellen will be discontinued when the next service of the instruments is due during summer 2011.

The matters considered by this Progress Report will be considered and presented in the Updating and Screening Assessment in April 2012.

6 References

- (1) Argyll & Bute Council, Updating & Screening Assessment of Air Quality, May 2003
- (2) Argyll and Bute Council, Local Air Quality Management Progress Report and Detailed Assessment, April 2007
- (3) Argyll and Bute Council, Updating & Screening Assessment of Air Quality, April 2006
- (4) Argyll and Bute Council, Air Quality Study of Port Ellen Maltings, Islay, October 2005
- (5) Defra in partnership with the devolved administrations, Technical Guidance LAQM.TG(09), February 2009
- (6) <http://uk-air.defra.gov.uk/news?view=120>
- (7) <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>
- (8) Argyll and Bute Council, Detailed Assessment of Emissions from Domestic Solid Fuel Burning in Tarbert, November 2005

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Nitrogen dioxide diffusion tubes are supplied and analysed by Glasgow Scientific Services. The preparation method used is 20% TEA in water and the 2010 bias adjustment factor of 1.10 was obtained from Spreadsheet Version 04/11⁷. No local co-location studies were available to produce bias adjustment factors.

PM Monitoring Adjustment

The Volatile Correction Model cannot be used for the TEOM monitoring data as there are no FDMS instruments within range. The results for the annual mean have been corrected to gravimetric equivalence by applying the equation *Reference equivalent $PM_{10} = TEOM \times 1.3 - 2.2494$* as directed by the UK Air Quality Archive⁶.

QA/QC of automatic monitoring

PM₁₀ Monitoring

Service of TEOM

The TEOM is covered by a service and maintenance contract with Air Monitors Ltd which covers cleaning of components, calibration checks, flow and leak checks, and replacement of consumable items. The performance of the tapered element is checked against a pre-weighed filter & the result checked against the stated calibration constant. Records are kept of any service or maintenance of the analyser.

Data Handling and Validation

Raw data is downloaded at intervals not exceeding 25 days. The raw data file is opened in Excel and is visually examined for suspect data which is deleted from the data set before subsequent calculation of periodic means. Readings that are generally considered invalid are:

- Readings indicated by the analyser as invalid
- Several consecutive zero readings
- Minus concentrations

The raw data file is retained so it can re-examined at a late date if deemed necessary. The validated data file is saved in an Excel spreadsheet where it is used to calculate the 24 hour mean and to allow subsequent presentation in graphical format. All concentrations are multiplied by corrected to gravimetric equivalence by application of the *Reference equivalent $PM_{10} = TEOM \times 1.3 - 2.2494$* . 24 hour mean values are only calculated where data capture in the 24 hour period exceeds 75%. A

separate spreadsheet is produced for each quarter starting January 1st. A fifth spreadsheet is produced as a combination of the four quarterly spreadsheets. This allows for calculation of the annual mean and presentation of graphical results.

Data ratification

Completed quarterly spreadsheets are checked periodically to ensure that the data results are reliable and consistent. This includes:

- Checking the characteristics of the plotted results to highlight any potential baseline drift or departure from the normal range of readings.
- Check any high readings against the results from other sites to help identify any possible PM₁₀ episodes.
- Investigate potential local changes in the local environment that may have produced changes in PM₁₀ concentrations.

Carbon monoxide monitoring

Service of Streetbox Monitors

The Streetboxes are covered by a service and maintenance contract with Signal Ambitech Ltd which covers calibration checks and replacement of consumable items. Records are kept of any service or maintenance of the analyser.

Data Handling and Validation

Raw data is downloaded at intervals not exceeding 100 days. The raw data file is opened in Excel and is visually examined for suspect data which is deleted from the data set before subsequent calculation of periodic means. Readings that are generally considered invalid are:

- Readings indicated by the analyser as invalid
- Minus concentrations

The raw data file is retained so it can re-examined at a late date if deemed necessary. The validated data file is saved in an Excel spreadsheet where it is used to convert the raw data to mg/m³, to calculate the hourly mean and running 8 hour mean and to allow subsequent presentation in graphical format. 8 hour mean values are only calculated where data capture in the 8 hour period exceeds 75%. An annual spreadsheet is produced for each monitor starting January 1st.

Data ratification

Completed quarterly spreadsheets are checked periodically to ensure that the data results are reliable and consistent. This includes:

- Checking the characteristics of the plotted results to highlight any potential baseline drift or departure from the normal range of readings.
- Investigate any changes in the method of working at the Maltings that may have affected the magnitude of measured CO concentrations.

- Investigate other potential local changes in the local environment that may have produced changes in concentrations.

QA/QC of diffusion tube monitoring

The NO₂ diffusion tubes are supplied and analysed by Glasgow Scientific Services and prepared by using 20% TEA in water. The duration of exposure is normally the 4/5 week period suggested by the calendar provided by Defra. Glasgow Scientific Services have adopted the procedures for preparation and analysis contained in the document "Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance." Section 3 of this document also provides the basis for the operation of the Council's diffusion tube network.

A bias adjustment factor was applied to the annual mean NO₂ concentrations for 2010. The factor of 1.10 was obtained from Spreadsheet Version Number 04/11 downloaded from the Review and Assessment website⁷.

Appendix B: Monitoring Results and Graphs

Figure 1 PM_{10} Monitoring Results

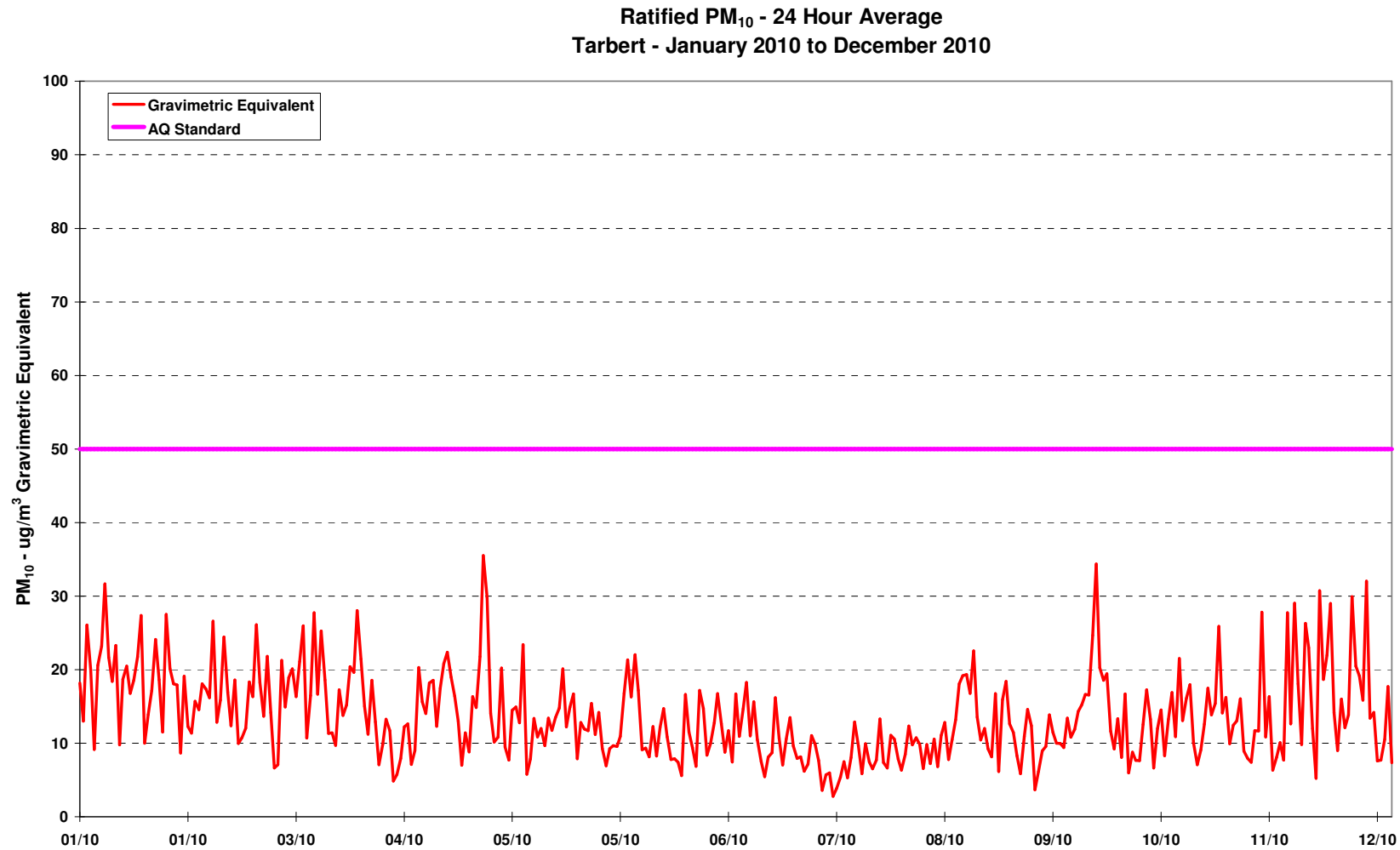


Figure 2 Carbon Monoxide Monitoring Results

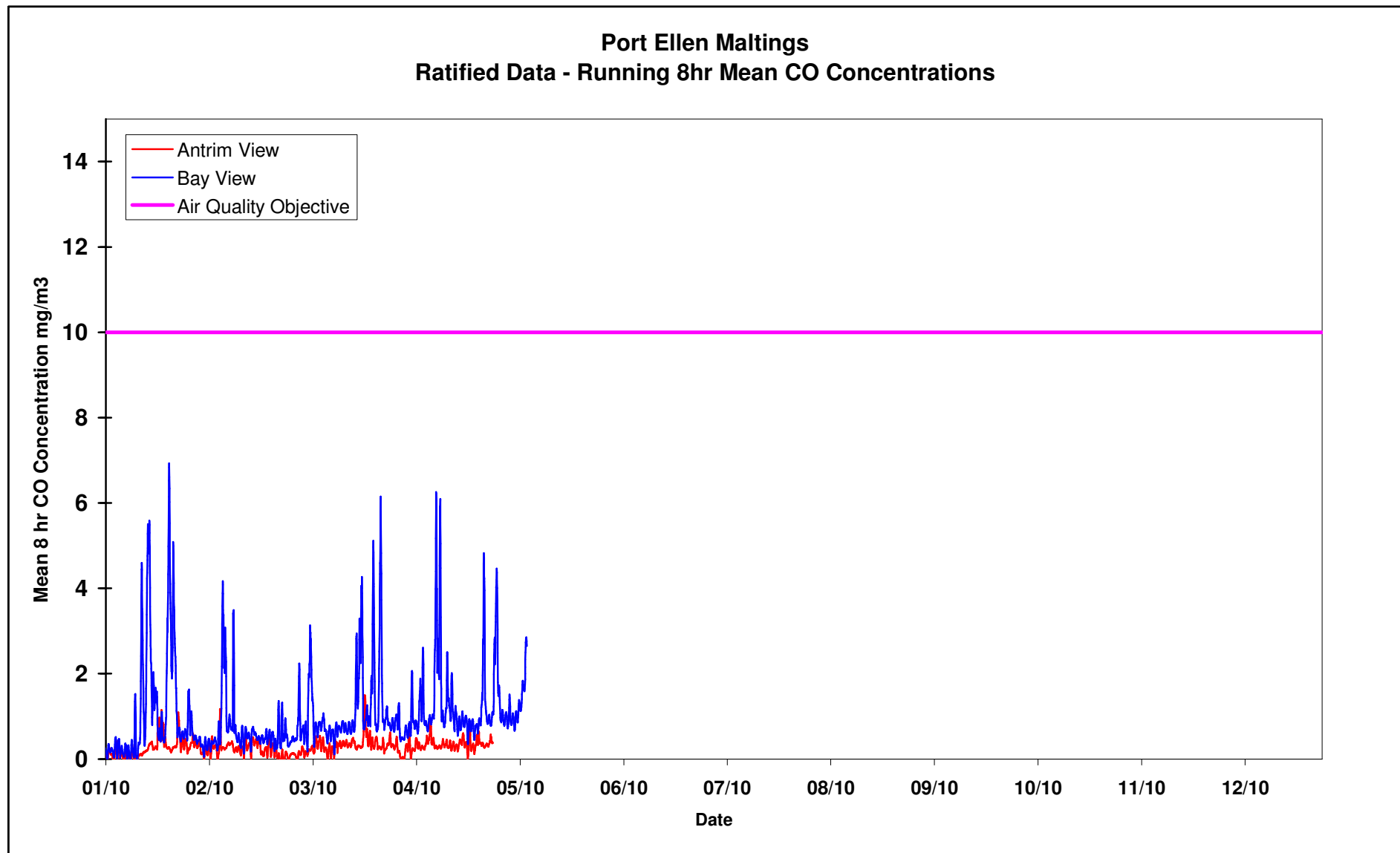
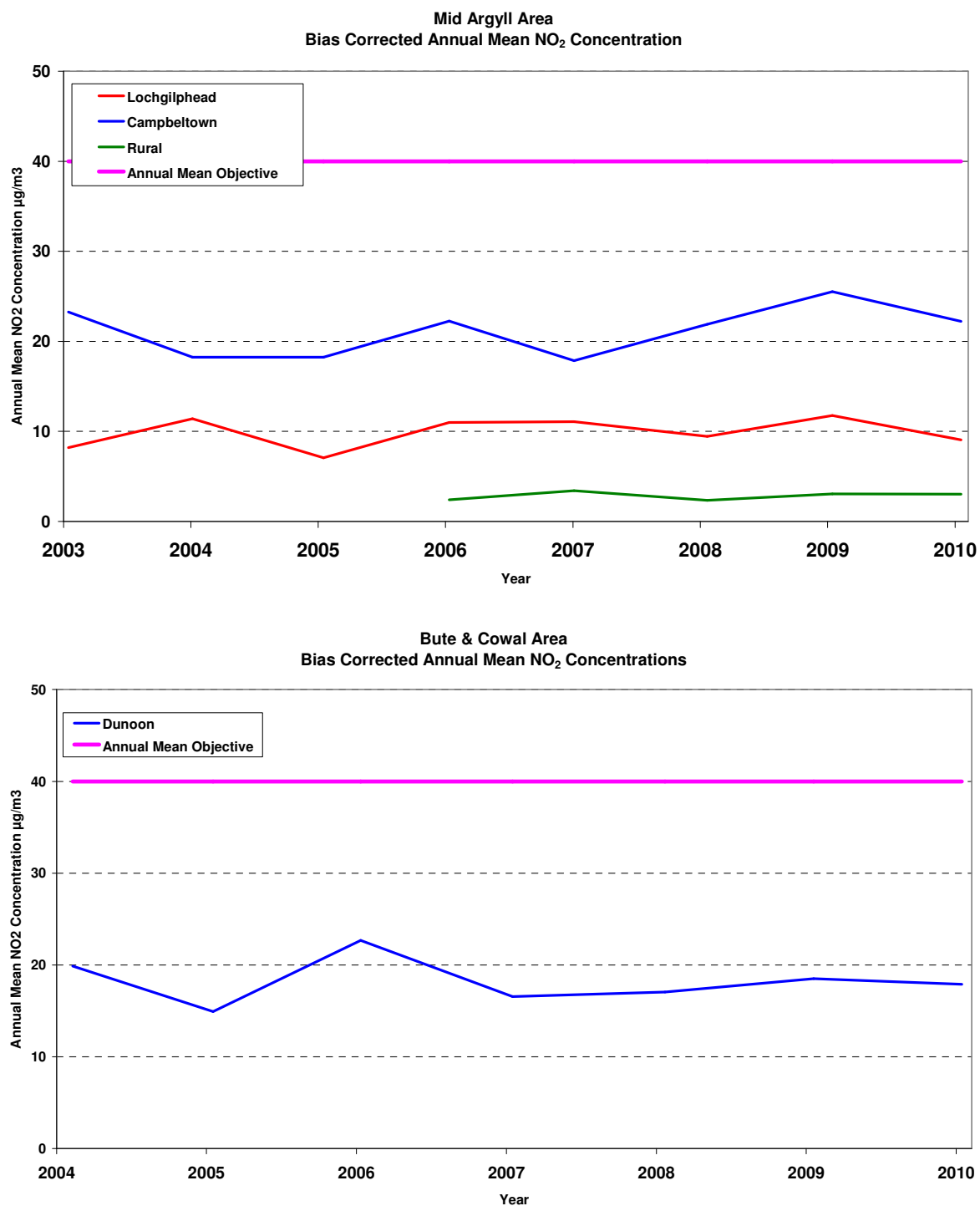


Table B.1 Monthly Nitrogen Dioxide Diffusion Tube Monitoring Results

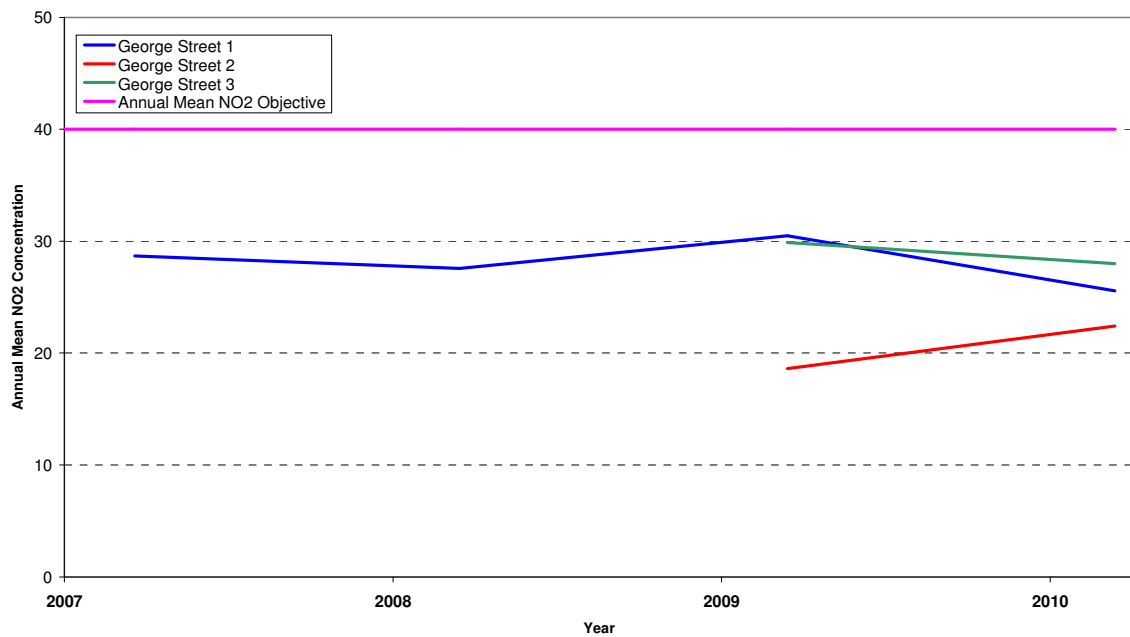
| 2009 | George St 1 Oban | George St 2 Oban | George St 3 Oban | Lochgilphead | Campbeltown | Mid Argyll Rural | Dunoon | Helensburgh E. Princess St | Helensburgh Sinclair St | Cardross |
|-----------|------------------------|------------------------|------------------------|--------------|-------------|---------------------|--------|-------------------------------|----------------------------|----------|
| January | 25 | 18 | 29 | | 21 | 7 | | 23 | | 25 |
| February | 19 | 25 | 32 | 12 | 29 | 3 | 15 | 25 | | 15 |
| March | 33 | 29 | 31 | 12 | 27 | 2 | 17 | 18 | | 19 |
| April | 16 | 19 | 22 | 8 | 17 | 3 | 14 | 15 | | 12 |
| May | 19 | 20 | 20 | 6 | 18 | 2 | 10 | 10 | | 13 |
| June | 26 | 25 | 19 | 5 | 22 | 2 | 13 | 16 | 8 | 9 |
| July | 20 | 28 | 23 | 5 | 18 | 2 | 12 | 16 | 12 | 8 |
| August | 24 | | 24 | 7 | 17 | 2 | 13 | 22 | 18 | 16 |
| September | 19 | 12 | 18 | 6 | 17 | 2 | | 13 | 10 | 9 |
| October | 23 | 24 | 20 | 10 | 23 | 3 | | 22 | 19 | 19 |
| November | 29 | 33 | 32 | 10 | 16 | | 30 | 28 | 23 | 28 |
| December | 24 | 32 | 36 | 15 | 17 | 2 | 23 | 22 | 29 | 34 |

Note: Tube resited in Cardross from June onwards

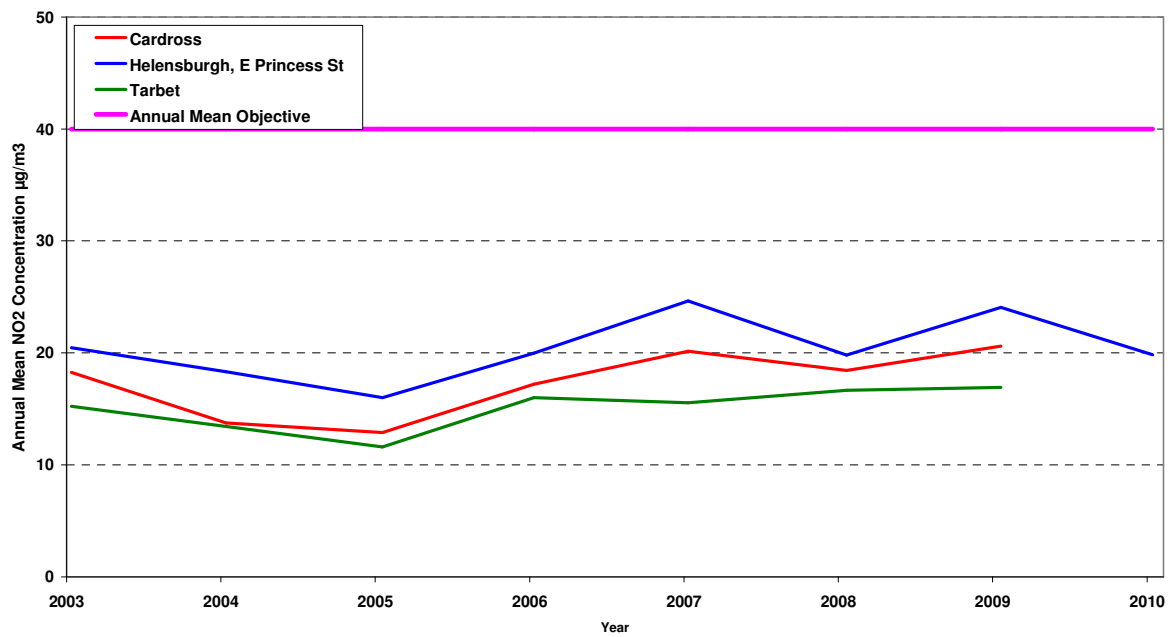
Figure 3 **Graphs of Annual NO₂ Trends**



Oban, Lorn & Isles Area
Bias Corrected Annual Mean NO₂ Concentration



Helensburgh & Lomond Area
Bias Corrected Annual Mean NO₂ Concentration



Appendix C: Maps

Figure 4 Major Settlements



Figure 5 Major Ports & Airports



Figure 6 Monitoring Locations



Figure 7 PPC Installations

