# Annual Progress Report (APR)


2017 Air Quality Annual Progress Report (APR) for
Angus Council

In fulfilment of Part IV of the
Environment Act 1995

Local Air Quality Management

June 2017

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|---|---|
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# Executive Summary: Air Quality in Our Area

## Air Quality in Angus Council

Air quality monitoring data available for 2016 confirm that air quality across Angus remains good. Measured concentrations of nitrogen dioxide ($NO_2$) and particulate matter ($PM_{10}$) are below the relevant objectives, and continue to reduce at most monitoring locations.

No new significant sources of pollutant emissions have been identified within the Angus Council area.

## Actions to Improve Air Quality

Angus Council has implemented several actions in recent years which aimed to improve public transport, both in terms of reduced emissions and increased availability of services, and to reduce the number of journeys made by private car. The majority of these actions are now fully implemented.

## Local Priorities and Challenges

Angus Council will continue to monitor $NO_2$ and $PM_{10}$ concentrations during 2017, and will report on progress in 2018.

## How to Get Involved

We can all help to maintain good air quality within Angus. Travel choices can have a significant impact on pollutant emissions; reducing single occupancy car travel; using alternatives such as public transport; and walking and cycling for short journeys all help to reduce emissions. A number of online tools are available to help you plan your journey: www.GoToo.com and www.travelinescotland.com. When you do travel by car, avoiding excessive acceleration and hard braking will also reduce the impact of the journey.

If you would like further information on Air Quality within Angus, please visit our website, or contact us via ACCESSline (08452 777 778).

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# 1. Local Air Quality Management

This report provides an overview of air quality in Angus Council during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 an exceedance is considered likely, the local authority must 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. This Annual Progress Report (APR) summarises the work undertaken by Angus Council to improve air quality and any progress that has been made.

**Table 1.1 – Summary of Air Quality Objectives in Scotland**

| Pollutant | Air Quality Objective | | Date to be achieved by |
|---|---|---|---|
| | Concentration | Measured as | |
| **Nitrogen dioxide ($NO_2$)** | 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 |
| **Particulate Matter ($PM_{10}$)** | 50 µg/m$^3$, not to be exceeded more than 7 times a year | 24-hour mean | 31.12.2010 |
| | 18 µg/m$^3$ | Annual mean | 31.12.2010 |
| **Particulate Matter ($PM_{2.5}$)** | 10 µg/m$^3$ | Annual mean | 31.12.2020 |
| **Sulphur dioxide ($SO_2$)** | 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 |
| **Benzene** | 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 |

| Pollutant | Air Quality Objective | | Date to be achieved by |
|---|---|---|---|
| | Concentration | Measured as | |
| **Lead** | 0.25 µg/m$^3$ | Annual Mean | 31.12.2008 |

# 2. Actions to Improve Air Quality

## 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives. Angus Council currently does not have any AQMAs.

Air quality is maintained through local policies and plans; the Angus Local Development Plan (2016) sets out the strategies and policies to promote development which minimises adverse impacts on the environment. These policies include Policy DS4 Amenity, which states that:

"*All proposed development must have full regard to opportunities for maintaining and improving environmental quality. Development will not be permitted where there is an unacceptable adverse impact on the surrounding area or the environment or amenity of existing or future occupiers of adjoining or nearby properties.*

*Angus Council will consider the impacts of development on….Air quality….Applicants may be required to submit detailed assessments in relation to any of the above criteria for consideration.*"

## 2.2 Progress and Impact of Measures to address Air Quality in Angus Council

Angus Council has continued to progress a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.1. The main measure taken forwards in 2016 was the preparation of the North East Scotland Sustainable Energy Action Plan (SEAP).

The four local authorities of Aberdeenshire, Aberdeen City, Angus and Moray have developed a regional SEAP as well as providing individual SEAPs for each authority. The SEAP proposes significant and implementable climate change mitigation policies

and actions to develop the low carbon economy in the region, considering both authority specific and regional mitigation actions. The energy and GHG impacts of each policy/action have been estimated and compared with targets for reductions, whilst also considering the impacts on local air quality. This document will be published and adopted in due course.

## Table 2.1 – Progress on Measures to Improve Air Quality

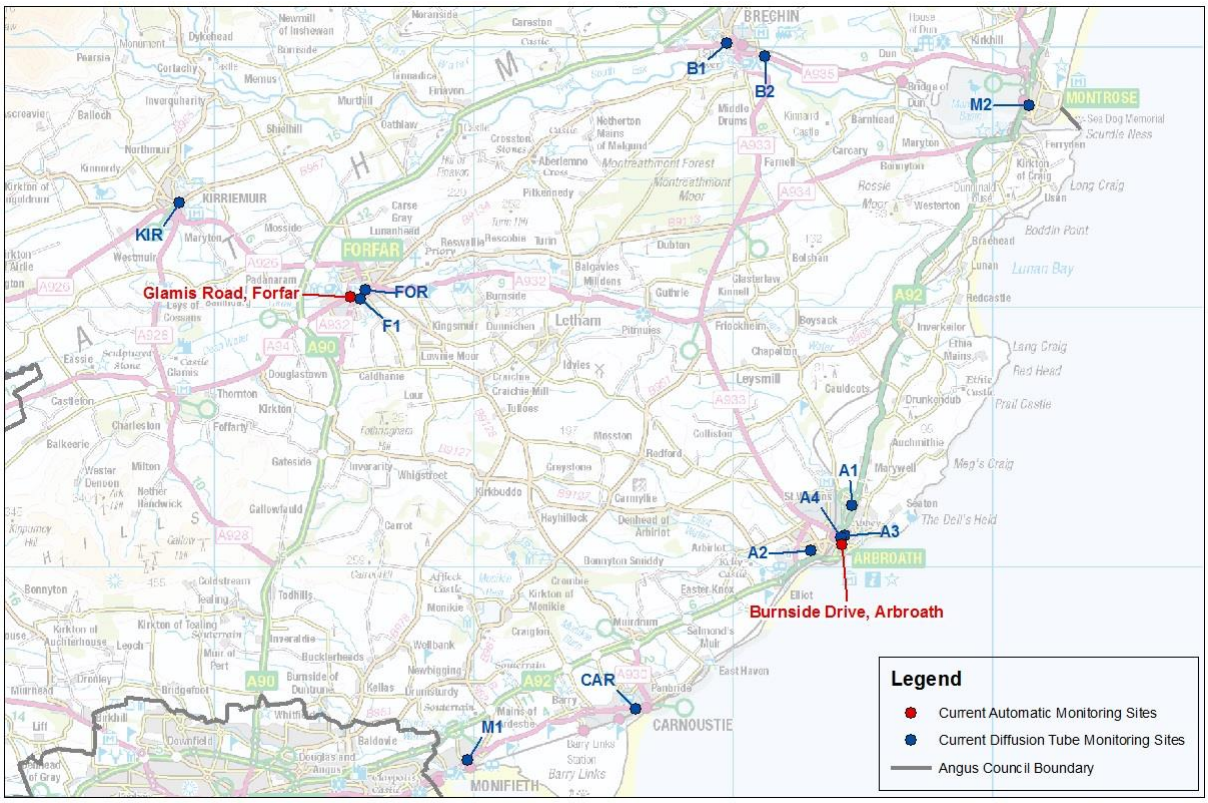
| Measure No. | Measure | Category | Focus | Lead Authority | Planning Phase | Implementation Phase | Key Performance Indicator | Comments |
|---|---|---|---|---|---|---|---|---|
| 1 | 'Smarter Choices Smarter Places' 'Angus on the Go' campaign | Promoting low emission transport; Public information; Promoting travel alternatives | Grant funding used to promote active and sustainable travel. | Angus Council | 2015 | 2015-2016 | • Promotional events to launch 'Angus on the Go'<br>• Promotion of bus travel with on-bus adverts and display in shelters<br>• Angus on the Go Leaflet for Brechin Community Campus showing bus routes, walking routes and cycling<br>• Distribution of Leaflet door to door in Brechin together with bus timetables for the local services<br>• Provision of cycle racks and cycle training in schools<br>• Provision of active travel training in schools<br>• Promotional events to promote public transport use and cycle provision on bus service X7 Aberdeen to Perth<br>• Funding of the Cycle Hub (a social enterprise) for refurbishment of bikes and doctor bike sessions<br>• Providing folders with public transport, liftshare, cycling and walking information for all the Angus Council hospitals | These measures have been implemented or are ongoing (e.g. the Cycle Hub) |
| 2 | New bus services introduced | Transport planning and infrastructure | Grant funding used for active and sustainable travel to encourage model shift. | Angus Council | 2014 | January 2015 | • New direct service introduced between Dundee – Forfar – Brechin – Stracathro Hospital and Edzell.<br>• Marketing to promote the service<br>• Quality contract with vehicles with Euro 5 or better engines scoring higher | Service commenced Jan 2015.<br>Hybrid buses introduced |

| Measure No. | Measure | Category | Focus | Lead Authority | Planning Phase | Implementation Phase | Key Performance Indicator | Comments |
|---|---|---|---|---|---|---|---|---|
| 3 | Hybrid Buses | Transport planning and infrastructure | 18 hybrid buses on the Arbroath to Dundee (Tayway corridor) Environmentally friendly vehicles on the X7 Aberdeen to Perth corridor | Stagecoach bus company partly funded by the Scottish Government Green Bus Fund | 2014 | 2015 | • For approximately 25% of the Stagecoach fleet in Angus and Dundee<br>• Stagecoach fuel consumption was down (due to replacement of Euro 5 by Euro 6)<br>• $CO_2$ reduction by 16%<br>• Hydrocarbons have reduced by at least 72%<br>• $NO_X$ had reduced by 80 %<br>• Particulates have reduced by 50%<br>• Over 35% fuel burn emission reduction | To be provided by Stagecoach |
| 4 | Multi-operator smart ticketing scheme | Transport planning and infrastructure; Promoting travel alternatives; Vehicle fleet efficiency | Allow passengers to travel on different operators' services with the same ticket, to reduce travel costs. | Bus companies | 2015 | August 2016 | • Implementing initially on a zone covering Monifieth, Monikie, Tealing, Muirhead and Liff<br>• Extend the scheme in due course across Angus | |
| 5 | Smarter Choices Smarter Places' funding | Promoting low emission transport; Public information; Promoting Travel alternatives | Extended Grant funding to continue with work from 2015-2016 | Angus Council | 2016-2017 | 2016-2017 | • Producing a leaflet of how to get to the new Forfar Community Campus (distributed door to door), carrying on with active travel training in schools in Forfar, Arbroath and Brechin predominantly | Done |
| 6 | Angus Council has signed up to North East Scotland Sustainable Energy Action Plan | Policy guidance and development control | North East Scotland Sustainable Energy Action Plan | North East Councils | 2016-2030 | Ongoing | • Produce a strategic document which covers all areas of sustainable energy across business and commercial, domestic and transport including certain aspects of land use and fuel supply. | Ongoing. A regional SEAP has been produced along with individual SEAPs for each authority |

# 3. Air Quality Monitoring Data and Comparison with Air Quality Objectives

## 3.1 Summary of Monitoring Undertaken

This section sets out the monitoring that has taken place in 2016, and how local concentrations of the measured pollutants compare with the objectives. The locations of the current monitoring sites are shown below.

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### 3.1.1 Automatic Monitoring Sites

Angus Council undertook automatic (continuous) monitoring of $PM_{10}$ at two sites during 2016. A gravimetric Partisol sampler is located at the Burnside Drive, Arbroath site, whilst an FDMS TEOM analyser is located at the Glamis Road, Forfar site. Table A.1 in Appendix A describes the details of these sites. National monitoring results (for the FDMS) are available at http://www.scottishairquality.co.uk/. Angus Council do not carry out any automatic monitoring of $NO_2$ concentrations.

Further details of the Quality Assurance/Quality Control (QA/QC) and how the data have been adjusted are included in Appendix C.

### 3.1.2 Non-Automatic Monitoring Sites

Angus Council undertook non-automatic (passive) monitoring of $NO_2$ at 12 sites during 2016. Table A.2 in Appendix A provides the details of the sites, whilst Appendix B provides the full 2016 dataset of monthly mean values for each site.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

## 3.2 Individual pollutants

### 3.2.1 Nitrogen Dioxide ($NO_2$)

Table A.3 in Appendix A compares the ratified and bias adjusted monitored $NO_2$ annual mean concentrations for the past 6 years with the air quality objective of 40µg/m$^3$.

Concentrations at all 12 sites were well below the annual mean objective in 2016; the highest concentration was 21.2µg/m$^3$ measured at monitoring site F1 located on the St James Road, Forfar. At most monitoring sites, concentrations have reduced overall since 2011. The main exceptions are the urban background monitoring sites (A1 and A2), the roadside site at Abbey Path, Arbroath (A3), and the kerbside site in Kirriemuir (KIR), where concentrations have increased since 2011; concentrations, however, remain well below the annual mean objective. Concentrations at the kerbside site in High Street, Forfar (FOR) have remained similar over the 2011 – 2016 period.

### 3.2.2 Particulate Matter ($PM_{10}$)

Table A.4 in Appendix A compares the ratified and adjusted monitored $PM_{10}$ annual mean concentrations for the past 6 years with the air quality objective of 18µg/m$^3$.

Table A.5 in Appendix A compares the ratified continuous monitored $PM_{10}$ daily mean concentrations for the past 6 years with the air quality objective of 50µg/m$^3$, not to be exceeded more than 7 times per year.

The measured concentrations at both kerbside monitoring sites are well below the relevant objectives. Concentrations at the Burnside Drive, Arbroath monitoring site have reduced year-on-year since monitoring commenced in 2013.

### 3.2.3 Particulate Matter ($PM_{2.5}$)

Angus Council do not currently monitor $PM_{2.5}$ concentrations and have no plans to do so in the future.

### 3.2.4 Sulphur Dioxide ($SO_2$)

Angus Council do not currently monitor $SO_2$ concentrations and have no plans to do so in the future.

### 3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Angus Council do not currently monitor carbon monoxide, lead or 1,3-butadiene concentrations, and have no plans to do so in the future.

# 4. New Local Developments

## 4.1 Road Traffic Sources

Angus Council confirm that no new Road Traffic sources have been identified which may have a significant impact on local air quality.

## 4.2 Other Transport Sources

Angus Council confirm that no new Other Transport sources have been identified which may have a significant impact on local air quality.

## 4.3 Industrial Sources

Angus Council confirm that no new or significantly changed Industrial sources have been identified which may have a significant impact on local air quality.

## 4.4 Commercial and Domestic Sources

Angus Council confirm that no new Commercial and Domestic sources have been identified which may have a significant impact on local air quality.

## 4.5 New Developments with Fugitive or Uncontrolled Sources

Angus Council confirm that no new Developments with Fugitive or Uncontrolled sources have been identified which may have a significant impact on local air quality.

## 5. Planning Applications

No planning applications for major developments with the potential to significantly impact air quality have been identified since the 2016 APR was prepared.

# 6. Conclusions and Proposed Actions

## 6.1 Conclusions from New Monitoring Data

Concentrations of nitrogen dioxide measured at 12 monitoring sites across the Angus Council area were well below the annual mean objective in 2016. Concentrations have reduced at most monitoring sites in recent years.

$PM_{10}$ concentrations measured at two kerbside/roadside monitoring sites were also well below the relevant objectives.

A Detailed Assessment is not required for either pollutant.

## 6.2 Conclusions relating to New Local Developments

No new or significantly changed sources of pollutant emissions have been identified within the Angus Council area in 2016. There have been no new road traffic, other transport, industrial, commercial, domestic or fugitive sources of emissions for which a Detailed Assessment is required.

## 6.3 Proposed Actions

Angus Council will continue monitoring nitrogen dioxide and $PM_{10}$ concentrations.

An APR will be submitted in 2018 setting out 2017 monitoring data and details of any newly identified sources.

# Appendix A: Monitoring Results

**Table A.1 – Details of Automatic Monitoring Sites**

| Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA ? | Monitoring Technique | Distance to Relevant Exposure (m) | Distance to kerb of nearest road (m) | Inlet Height (m) |
|---|---|---|---|---|---|---|---|---|---|
| Burnside Drive, Arbroath | Kerbside | 364169 | 740861 | $PM_{10}$ | N | Gravimetric | 4 | 1 | 1.5 |
| Glamis Road, Forfar | Roadside | 345249 | 750386 | $PM_{10}$ | N | FDMS | 20 | 6 | 1.5 |
| *Chapelpark Primary School, Forfar** | *Roadside* | *345914* | *750612* | *$PM_{10}$* | *N* | *Gravimetric* | *0* | *5* | *1.5* |
| *Chapelpark Primary School, Forfar** | *Roadside* | *345914* | *750613* | *$PM_{10}$* | *N* | *FDMS* | *0* | *6* | *1.5* |
| *Peel Park Primary School, Glenisla** | *Rural Background* | *326515* | *754046* | *$PM_{10}$* | *N* | *Gravimetric* | *0* | *20* | *1.5* |
| ** Monitoring ceased in 2012* | | | | | | | | | |

**Table A.2 – Details of Non-Automatic Monitoring Sites**

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Distance to Relevant Exposure (m) | Distance to kerb of nearest road (m) | Tube collocated with a Continuous Analyser? |
|---|---|---|---|---|---|---|---|---|---|
| A1 | Ethie Terrace, Arbroath | Urban Background | 364585 | 742349 | $NO_2$ | N | 0 | 1 | N |
| A2 | Inchcape Road, Arbroath | Urban Background | 362987 | 740642 | $NO_2$ | N | 0 | 2 | N |
| A3 | Abbey Path, Arbroath | Roadside | 364299 | 741225 | $NO_2$ | N | 1.5 | <1 | N |
| A4 | 22 Lordburn, Arbroath | Roadside | 364158 | 741122 | $NO_2$ | N | 3 | <1 | N |
| CAR | High St, Carnoustie | Kerbside | 356243 | 734526 | $NO_2$ | N | 3 | 2 | N |
| M1 | High St, Monifieth | Kerbside | 349759 | 732549 | $NO_2$ | N | 0 | 2 | N |
| M2 | High St, Montrose | Kerbside | 371418 | 757767 | $NO_2$ | N | 2 | 1 | N |
| B1 | High St, Brechin | Kerbside | 359727 | 760170 | $NO_2$ | N | 2 | 1 | N |
| B2 | Sacone 1, Brechin | Industrial | 361216 | 759644 | $NO_2$ | N | NA | 8 | N |

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Distance to Relevant Exposure (m) | Distance to kerb of nearest road (m) | Tube collocated with a Continuous Analyser? |
|---|---|---|---|---|---|---|---|---|---|
| FOR | High St, Forfar | Kerbside | 345825 | 750674 | $NO_2$ | N | 3 | <1 | N |
| KIR | Manse Close, Kirriemuir | Kerbside | 338621 | 754032 | $NO_2$ | N | 5 | 6 | N |
| F1 | St James Road, Forfar | Roadside | 345628 | 750307 | $NO_2$ | N | <1 | 2 | N |
| *F2** | *Dundee Loan, Forfar* | *Roadside* | *345342* | *750088* | *$NO_2$* | *N* | *<1* | *2* | *N* |
| ** Monitoring ceased in 2012* | | | | | | | | | |

**Table A.3 – Annual Mean $NO_2$ Monitoring Results**

| Site ID | Site Type | Monitoring Type | Valid Data Capture 2016 (%) | $NO_2$ Annual Mean Concentration ($\mu g/m^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| A1 | Urban Background | Diffusion Tube | 100 | 7.0 | 7.1 | 5.0 | 9.8 | 8.9 | 8.2 |
| A2 | Urban Background | Diffusion Tube | 100 | 8.8 | 9.5 | 8.0 | 11.0 | 11.6 | 11.3 |
| A3 | Roadside | Diffusion Tube | 100 | 17.7 | 15.6 | 15.0 | 18.5 | 19.6 | 20.1 |
| A4 | Roadside | Diffusion Tube | 100 | 21.1 | 21.3 | 17.5 | 18.2 | 18.0 | 17.5 |
| CAR | Kerbside | Diffusion Tube | 100 | 20.3 | 20.1 | 16.8 | 22.9 | 15.6 | 15.1 |
| M1 | Kerbside | Diffusion Tube | 100 | 23.4 | 23.3 | 19.4 | 17.4 | 14.6 | 15.9 |
| M2 | Kerbside | Diffusion Tube | 100 | 23.8 | 26.1 | 21.7 | 21.0 | 20.1 | 19.3 |
| B1 | Kerbside | Diffusion Tube | 92 | 14.8 | 16.8 | 14.0 | 15.0 | 13.5 | 14.2 |
| B2 | Industrial | Diffusion Tube | 100 | 8.1 | 8.0 | 6.9 | 7.8 | 6.8 | 6.2 |

| Site ID | Site Type | Monitoring Type | Valid Data Capture 2016 (%) | $NO_2$ Annual Mean Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| FOR | Kerbside | Diffusion Tube | 100 | 17.0 | 17.0 | 15.8 | 16.1 | 16.3 | 16.8 |
| KIR | Kerbside | Diffusion Tube | 100 | 12.3 | 11.7 | 12.0 | 13.4 | 12.8 | 13.3 |
| F1 | Roadside | Diffusion Tube | 100 | - | 23.0 | 21.0 | 21.3 | 21.3 | 21.2 |
| *F2* | *Roadside* | *Diffusion Tube* | - | - | *21.1* | *18.2* | - | - | - |

Notes: Exceedances of the $NO_2$ annual mean objective of 40µg/m$^3$ are shown in **bold**.

$NO_2$ annual means exceeding 60µg/m$^3$, indicating a potential exceedence of the $NO_2$ 1-hour mean objective are shown in **bold and underlined.**

## Trend in Annual Mean Nitrogen Dioxide Concentrations

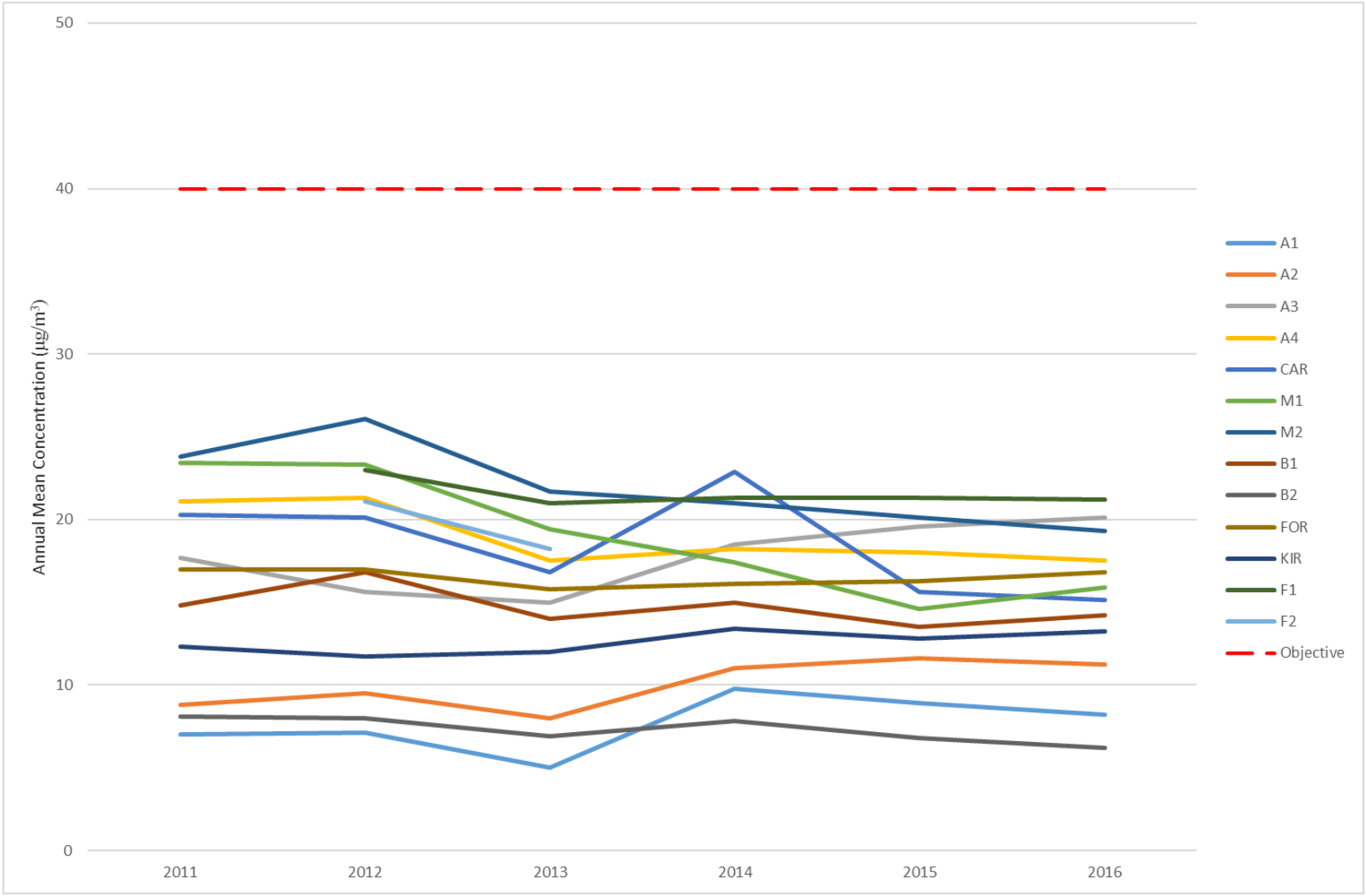

**Table A.4 – Annual Mean $PM_{10}$ Monitoring Results**

| Site ID | Site Type | Valid Data Capture 2016 (%) | $PM_{10}$ Annual Mean Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Burnside Drive, Arbroath | Kerbside | 30.1 | - | - | 16.5 | 15.6 | 14.3 | 13.0* |
| Glamis Road, Forfar | Kerbside | 86.6 | - | - | - | - | 10.2 | 10.5 |
| *Chapelpark Primary School, Forfar* | *Roadside* | - | *18* | *17* | - | - | - | - |
| *Chapelpark Primary School, Forfar* | *Roadside* | - | *17.2* | *14.5* | - | - | - | - |
| *Peel Park Primary School, Glenisla* | *Rural Background* | - | *8.9* | *6.6* | - | - | - | - |

Notes: Exceedances of the $PM_{10}$ annual mean objective of 18µg/m$^3$ are shown in **bold.**

* The annual mean concentration presented for this site is the annual mean equivalent concentration ("annualised" as per LAQM.TG(16), as data capture for the full calendar year is less than 75%). See Appendix C for details.

**Table A.5 – 24-Hour Mean $PM_{10}$ Monitoring Results**

| Site ID | Site Type | Valid Data Capture 2016 (%) | $PM_{10}$ 24-Hour Means > 50µg/m$^3$ | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Burnside Drive, Arbroath | Kerbside | 30.1 | - | - | 5 (52.8) | 0 (31.6) | 1 (34.9) | 0 (23.5) |
| Glamis Road, Forfar | Kerbside | 86.6 | - | - | - | - | 1 (32.0) | 0 |
| *Chapelpark Primary School, Forfar* | *Roadside* | - | *0* | *2* | - | - | - | - |
| *Chapelpark Primary School, Forfar* | *Roadside* | - | *2* | *1 (38.4)* | - | - | - | - |
| *Peel Park Primary School, Glenisla* | *Rural Background* | - | *1* | *0 (19.0)* | - | - | - | - |

Notes: Exceedances of the $PM_{10}$ 24-hour mean objective (50µg/m$^3$ not to be exceeded more than 7 times/year) are shown in **bold.**

Values in brackets represent the 98.1$^{st}$ percentile of 24-hour means, presented where data capture is less than 85% of the calendar year.

## Appendix B: Full Monthly Diffusion Tube Results for 2016

**Table B.1 – $NO_2$ Monthly Diffusion Tube Results for 2016**

| Site ID | $NO_2$ Mean Concentrations ($\mu g/m^3$) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean | |
| | | | | | | | | | | | | | Raw Data | Bias Adjusted (1) |
| A1 | 15.4 | 11.5 | 12.3 | 8.5 | 8.8 | 7.7 | 7.4 | 8.1 | 9.5 | 9.6 | 12.3 | 16.9 | 10.7 | 8.2 |
| A2 | 20.1 | 16.8 | 16.4 | 11.9 | 10.9 | 10.7 | 10.2 | 10.1 | 12.3 | 13.1 | 20.9 | 22.0 | 14.6 | 11.3 |
| A3 | 31.4 | 27.0 | 32.5 | 25.2 | 23.2 | 20.5 | 22.6 | 19.6 | 25.6 | 22.4 | 34.5 | 29.2 | 26.1 | 20.1 |
| A4 | 30.4 | 27.4 | 27.3 | 17.6 | 15.8 | 14.3 | 15.7 | 16.0 | 20.8 | 18.9 | 34.0 | 34.6 | 22.7 | 17.5 |
| CAR | 26.9 | 27.0 | 23.0 | 16.6 | 13.5 | 13.6 | 13.8 | 14.1 | 15.9 | 18.7 | 27.0 | 25.9 | 19.7 | 15.1 |
| M1 | 38.4 | 25.1 | 24.0 | 19.6 | 14.4 | 14.9 | 11.7 | 13.9 | 16.3 | 16.6 | 27.8 | 24.8 | 20.6 | 15.9 |
| M2 | 32.4 | 33.8 | 29.7 | 19.8 | 19.7 | 14.8 | 20.2 | 16.6 | 28.1 | 21.5 | 33.4 | 31.0 | 25.1 | 19.3 |
| B1 | - | 19.4 | 22.0 | 18.0 | 16.6 | 17.2 | 11.7 | 13.9 | 14.9 | 24.0 | 24.6 | 21.0 | 18.5 | 14.2 |
| B2 | 15.4 | 11.7 | 9.5 | 6.3 | 5.5 | 4.8 | 4.3 | 4.6 | 5.9 | 7.6 | 10.4 | 11.0 | 8.1 | 6.2 |

| Site ID | $NO_2$ Mean Concentrations ($\mu g/m^3$) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean | |
| | | | | | | | | | | | | | Raw Data | Bias Adjusted (1) |
| FOR | 30.4 | 30.4 | 28.1 | 17.6 | 14.8 | 14.4 | 13.6 | 13.9 | 18.4 | 21.3 | 31.8 | 27.6 | 21.9 | 16.8 |
| KIR | 26.7 | 22.1 | 22.6 | 14.3 | 12.3 | 11.5 | 12.1 | 11.3 | 13.6 | 14.0 | 25.2 | 20.8 | 17.2 | 13.3 |
| F1 | 37.1 | 35.1 | 32.7 | 21.8 | 16.8 | 21.8 | 18.5 | 18.4 | 21.0 | 24.4 | 53.0(2) | 30.0 | 27.6 | 21.2 |

(1) See Appendix C for details on bias adjustment

(2) The November result for monitoring site F1 is anomalously high compared to the results for other months; there is however no apparent reason to remove this value.

# Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

## Diffusion Tube QA/QC

Angus Council deploy diffusion tubes prepared and analysed by Tayside Scientific Services (TSS; 20% TEA in water method). Tubes are changed monthly.

### Bias Adjustment Factors from Local Co-location Studies

Angus Council do not operate a chemiluminescent analyser, and therefore no co-location study is carried out. It is therefore not possible to calculate a local bias adjustment factor.

### National Bias Adjustment Factor

The national bias adjustment factor for TSS in 2016 is 0.77 (taken from spreadsheet 03/17 v2, based on 1 study; available at: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html). This factor has been applied to all 2016 diffusion tube data.

### Air Proficiency Testing

Tayside Scientific Services take part in the UKAS accredited proficiency testing scheme Air PT, operated by LGC and the Health and Safety Laboratory (HSL). Available data for TSS in 2016 are provided below:

| Air PT Round | AR012 | AR013 | AR015 | AR016 |
|---|---|---|---|---|
| Period | Jan – Feb 2016 | April – May 2016 | July – Aug 2016 | Sept – Oct 2016 |
| Satisfactory Results (%) | 100 | NR | 100 | NR |

NR – no results reported

During 2016, 100% of samples submitted were determined to have been satisfactory.

**Automatic Monitoring QA/QC**

Angus Council change the Partisol filter cassettes fortnightly. The samplers are serviced bi-annually by Air Monitors Ltd.

Data from the FDMS analyser is collected via automatic telemetry by Ricardo Energy & Environment. The analyser is serviced on an annual basis and audited every six months. All data are ratified on a 6-monthly basis using procedures comparable to those used for national network monitoring data. Data are available on the Scottish air quality website (www.scottishairquality.co.uk).

**Short-term to Long-term Data Adjustment (Annualisation)**

Due to technical problems, data capture at the Arbroath Partisol analyser was low in 2016, and below the minimum requirement (of 75%). The data have therefore been adjusted to an annual mean, based on the ratio of concentrations during the short-term monitoring period to those over the 2016 calendar year. This has utilised data from three urban background monitoring sites whose data are available from the Scottish air quality website (www.scottishairquality.co.uk) where long-term $PM_{10}$ data are available (with data capture >90%).

1 Sept – 14 Nov, 24 Nov – 31 Dec 2016

| Site | 2016 Annual Mean | Period Mean | Ratio |
|---|---|---|---|
| Aberdeen Errol Place | 11.8 | 13.1 | 0.904 |
| Falkirk Grangemouth | 12.8 | 12.3 | 1.044 |
| Glasgow Townhead | 12.0 | 13.2 | 0.904 |
| | | Average | 0.951 |

## Glossary of Terms

| Abbreviation | Description |
|---|---|
| AQAP | Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values' |
| AQMA | Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives |
| APR | Air quality Annual Progress Report |
| AURN | Automatic Urban and Rural Network (UK air quality monitoring network) |
| Defra | Department for Environment, Food and Rural Affairs |
| FDMS | Filter Dynamics Measurement System |
| LAQM | Local Air Quality Management |
| $NO_2$ | Nitrogen Dioxide |
| $NO_x$ | Nitrogen Oxides |
| $PM_{10}$ | Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less |
| $PM_{2.5}$ | Airborne particulate matter with an aerodynamic diameter of 2.5µm or less |
| QA/QC | Quality Assurance and Quality Control |
| $SO_2$ | Sulphur Dioxide |