

# Air Quality Review and Assessment Progress Report 2007/8: Angus Council

**Report to Angus Council**

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## Executive summary

Angus Council has undertaken an air quality assessment programme under the strategic policy framework for air quality management published by the Scottish Government. Under this strategy each local authority has to undertake an Updating and Screening Assessment (USA) to determine the progress of their local air quality management to date. A USA has to be submitted to the Scottish Government every three years and an annual progress report every other year until 2010. If it has been concluded that Air Quality Strategy (AQS) objectives will not be met during this process then the authority has to proceed to a Detailed Assessment.

The existing air quality monitoring network, maintained by Angus Council, consists of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub>) monitoring throughout Angus.

Analysis of the 2007 NO<sub>2</sub> data, within this report, shows that measured annual average NO<sub>2</sub> concentrations are significantly below the 2010 AQS objective (40 µg m<sup>-3</sup>) and that projected concentrations to 2010 are likely to remain below the objective. Therefore, Angus Council is not required to proceed to a Detailed Assessment for NO<sub>2</sub>.

Analysis of the PM<sub>10</sub> data, contained within this report, shows that the annual mean objective (18 µg m<sup>-3</sup>) and daily mean objective (greater than 50 µg m<sup>-3</sup> not to be exceeded more than 7 times in one year) have been exceeded at the Forfar monitoring site (FOR2 (Grav)), as measured by the gravimetric sampler. However, it was concluded in the Detailed Assessment of PM<sub>10</sub> published in 2007, that although measured PM<sub>10</sub> concentrations in Forfar are approaching the AQS objectives, it was predicted that PM<sub>10</sub> concentrations will decrease between 2007 and 2010. It is therefore unlikely that an exceedence of the objectives will be measured in 2010. These conclusions are confirmed in this report and it is recommended that Angus Council maintain their current monitoring programme for PM<sub>10</sub>.

A review of new developments within the Angus area that could have an impact on air quality shows that Angus Council are not required to extend their current air quality monitoring network.



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# 1 Introduction

Angus Council has undertaken an air quality assessment programme under the strategic policy framework for air quality management published by the Scottish Government. Under this strategy each local authority has to undertake an Updating and Screening Assessment (USA) to determine the progress of their local air quality management to date. A USA has to be submitted to the Scottish Government every three years and an annual progress report every other year. If it has been concluded that Air Quality Strategy (AQS) objectives will not be met during this process then the authority has to proceed to a Detailed Assessment.

The air quality objectives for the purpose of review and assessment are shown in Table 1.

**Table 1 Objectives included in the Air Quality Regulations and subsequent Amendments for the purpose of Local Air Quality Management.**

National Air Quality Objectives			
Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
<b>Benzene</b>			
All authorities	16.25 $\mu\text{g m}^{-3}$	running annual mean	31.12.2003
Authorities in England and Wales only	5.00 $\mu\text{g m}^{-3}$	annual mean	31.12.2010
Authorities in Scotland and Northern Ireland only	3.25 $\mu\text{g m}^{-3}$	running annual mean	31.12.2010
<b>1,3-Butadiene</b>	2.25 $\mu\text{g m}^{-3}$	running annual mean	31.12.2003
<b>Carbon monoxide</b>			
Authorities in England, Wales and Northern Ireland only	10.0 $\text{mg m}^{-3}$	maximum daily running 8-hour mean	31.12.2003
Authorities in Scotland only	10.0 $\text{mg m}^{-3}$	running 8-hour mean	31.12.2003
<b>Lead</b>	0.5 $\mu\text{g m}^{-3}$ 0.25 $\mu\text{g m}^{-3}$	annual mean annual mean	31.12.2004 31.12.2008
<b>Nitrogen dioxide<sup>a</sup></b>	200 $\mu\text{g m}^{-3}$ not to be exceeded more than 18 times a year 40 $\mu\text{g m}^{-3}$	1 hour mean annual mean	31.12.2005 31.12.2005
<b>Particles (PM<sub>10</sub>) (gravimetric)<sup>b</sup></b>	50 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year 40 $\mu\text{g m}^{-3}$	24 hour mean annual mean	31.12.2004 31.12.2004
Authorities in Scotland only <sup>c</sup>	50 $\mu\text{g m}^{-3}$ not to be exceeded more than 7 times a year 18 $\mu\text{g m}^{-3}$	24 hour mean annual mean	31.12.2010 31.12.2010
<b>Sulphur dioxide</b>	350 $\mu\text{g m}^{-3}$ not to be exceeded more than 24 times a year 125 $\mu\text{g m}^{-3}$ not to be exceeded more than 3 times a year 266 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year	1 hour mean 24 hour mean 15 minute mean	31.12.2004 31.12.2004 31.12.2005

a. These objectives are provisional.

b. Measured using the European gravimetric transfer sampler or equivalent.

c. These 2010 Air Quality Objectives for PM<sub>10</sub> apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

The third round of the review and assessment process commenced in 2006. This report forms the Progress Report of air quality within the Angus Council area (Appendix 1) during 2007 and follows the guidance laid out in the Guidance Document<sup>1</sup> LAQM.PRG(03).

## 1.1 Purpose of the Progress Report

The Progress Report is the mechanism by which Local Authorities (LA) report on their air quality within the Local Air Quality Management (LAQM) process. The Progress Report should include the following information:

- Monitoring locations
- Monitoring data
- Trends in pollutant levels
- New developments that may impact on air quality e.g. new roads, industrial developments etc

Further information that is recommended to be included within the Progress Report includes:

- Projections of pollutant levels
- Unregulated pollutants e.g. ozone
- Action Plans
- Local Air Quality Strategy
- Planning and Policies
- Local Transport Plans and Strategies

This Progress Report will identify whether pollutant levels are decreasing within the Angus boundary and whether Angus Council will be required to proceed to a Detailed Assessment for any AQS pollutant.

## 1.2 Summary of Conclusions Previous Air Quality Review and Assessment Reports

A Local Air Quality Management Detailed Assessment<sup>2</sup> of PM<sub>10</sub> was undertaken in October 2007 as a result of the conclusions from the Updating and Screening Assessment<sup>3</sup> in 2006. Both assessments were carried out by Cordah BMT Ltd.

The 2006 USA concluded that it was unlikely that any AQS Objectives would be exceeded, including those for particulate matter. However, it was the view of SEPA and the Scottish Government that there was insufficient data available to confidently predict that particulate levels in Forfar would not exceed the 2010 National Objective. Therefore, Angus Council undertook a Detailed Assessment of particulate levels in Forfar.

The Detailed Assessment, carried out in 2007, concluded that although the 2010 AQS annual average objective of 18 µg m<sup>-3</sup> was exceeded during the period 1<sup>st</sup> June 2006 to 31<sup>st</sup> May 2007 in Forfar, it was predicted that PM<sub>10</sub> levels would drop below this level by 2010.

The main sources of PM<sub>10</sub> were attributed to the following sectors:

- Road traffic,
- Industrial processes,
- Domestic sources,
- Energy production, solvent use and off-road vehicle emission.

It was therefore recommended that the current monitoring programme should be maintained but that Angus Council were not required to declare an Air Quality Management Area (AQMA) for PM<sub>10</sub>.

## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

Angus Council currently carry out air quality monitoring of nitrogen dioxide (NO<sub>2</sub>) at 11 locations and particulate matter (PM<sub>10</sub>) at 3 locations throughout Angus. The monitoring programme consists of both automatic and non-automatic monitoring methods. The site details are summarised in Table 2 with site locations shown in Appendix 2.

**Table 2 Details of Air Quality Monitoring Sites in Angus 2007**

Site Location	Site Code	Pollutant Monitored	Monitoring Method	Site Classification	Grid Reference	Data Capture (%)
Ethie Ter, Arbroath	A1	NO <sub>2</sub>	Diffusion Tube	Background	365000, 743000	100
Inchape Rd, Arbroath	A2	NO <sub>2</sub>	Diffusion Tube	Background	363000, 741000	100
Abbey Path, Arbroath	A3	NO <sub>2</sub>	Diffusion Tube	Roadside	364000, 741000	100
22 Lordburn, Arbroath	A4	NO <sub>2</sub>	Diffusion Tube	Roadside	364000, 741000	100
High St, Carnoustie	CAR	NO <sub>2</sub>	Diffusion Tube	Kerbside	356000, 735000	100
High St, Monfieth	M1	NO <sub>2</sub>	Diffusion Tube	Kerbside	350000, 732000	100
High St, Montrose	M2	NO <sub>2</sub>	Diffusion Tube	Kerbside	732000, 758000	100
High St, Brechin	B1	NO <sub>2</sub>	Diffusion Tube	Kerbside	360000, 760000	100
Sacone 1, Brechin	B2	NO <sub>2</sub>	Diffusion Tube	Industrial	361000, 780000	91.7
Sacone2, Brechin	B3	NO <sub>2</sub>	Diffusion Tube	Industrial	361000, 780000	91.7
High St, Forfar	FOR	NO <sub>2</sub>	Diffusion Tube	Kerbside	351000, 746000	100
Manse Cl, Kirriemuir	KIR	NO <sub>2</sub>	Diffusion Tube	Kerbside	339000, 754000	100
Chaplepark Primary School, Forfar	FOR2 (Grav)	PM <sub>10</sub>	Gravimetric Partisol	Roadside	345914, 750613	73.2
Chaplepark Primary School, Forfar	FOR2 (FDMS)	PM <sub>10</sub>	FDMS	Roadside	345914, 750613	91.5
Kinloch Primary School, Carnoustie	CAR 2	PM <sub>10</sub>	Gravimetric Partisol	Rural Background	355726, 734524	91.5
Glenisla Primary School, Glenisla	G1	PM <sub>10</sub>	Gravimetric Partisol	Roadside	321255, 760411	73

Nitrogen dioxide is sampled at 11 sites across Angus using passive diffusion tubes. The diffusion tubes are exposed for one month and are sent to Tayside Scientific Services for analysis to determine a monthly-average concentration.

A Filter Dynamics Measurement System (FDMS) analyser was commissioned in July 2007, collocated with the Forfar Gravimetric sampler (FOR 2). The FDMS measures real-time 1-hour average PM<sub>10</sub> concentrations and consists of a Tapered Element Oscillating Microbalance (TEOM) fitted with an FDMS unit. The FDMS has been assessed to be equivalent to the EU Reference Method without the use of a correction factor. In addition to this, PM<sub>10</sub> is monitored at two further locations using Partisol samplers at Carnoustie and Glenisla. The air volume sampled is recorded and the filter is then weighed to calculate a daily average concentration. Tayside Scientific Services are currently used for the supply and analyses of the filters. The type of filters analysed by Tayside Scientific Services are Pallflex Emfab (Pall Life Sciences, TX40HI20-WW, 47mm).

The recommended data capture rate should be greater than or equal to 90% as outlined in Technical Guidance<sup>4</sup> LAQM.TG(03). All NO<sub>2</sub> diffusion tube sites and PM<sub>10</sub> sites FOR2 (FDMS) and CAR2 achieved a data capture of greater than 90%. Sites FOR2 (Partisol) and G1 achieved data capture of 73.2% and 72.6% respectively.

The following AQS pollutants are not monitored by Angus Council:

- Benzene,
- 1,3 butadiene,
- carbon monoxide
- lead,
- sulphur dioxide.

There are no existing or planned developments that are likely to result in any exceedence of the AQS objectives for the abovementioned pollutants. Furthermore, it is concluded in the 2006 USA Report that it is unlikely that any exceedence of the AQS objectives for any of these pollutants would occur, and hence, no monitoring of these pollutants is required.

## 2.2 Quality Assurance and Quality Control (QA/QC)

As outlined in Technical Guidance LAQM.TG(3), it is important to have QA/QC procedures in place in order to ensure that the air quality monitoring data are reliable and credible. The following list outlines basic data requirements:

- Accuracy.
- Precision.
- Traceability to national/international metrology standards.
- Long-term consistency.

The following sections outline the QA/QC procedures employed by Angus Council.

### 2.2.1 Nitrogen Dioxide Diffusion Tubes

Diffusion tubes used by Angus Council are supplied and analysed by Tayside Scientific Services (formerly Dundee City Council Scientific Services). The laboratory participates in 3 schemes, which ensure that the NO<sub>2</sub> tube results meet acceptable standards:

1. The WASP scheme, run by the Health and Safety Laboratory. Every three months, Tayside receive four diffusion tubes, spiked with set amounts of nitrite. They analyse the tubes and return the results to HSL. Results are compared with the known spiking levels, and with the results from other participating labs, and feedback on performance provided.
2. Every three months 3 tubes and a blank for analysis are supplied for exposure at a field intercomparison site operated as part of the Support to Local Authorities for Air Quality Management contract funded by the Scottish Government, Defra and the other DAs. Results are compared with those of the automatic chemiluminescent analyser at the site (which is defined as the reference method for NO<sub>2</sub>).

- Every six months a QC NO<sub>2</sub> solution is also provided to Tayside via this contract. This solution is used as an internal check for analysis of NO<sub>2</sub> tubes in the laboratory. Tayside test the QC solution after every 21 NO<sub>2</sub> tube samples.

Tayside Scientific Services also use in-house quality assurance standards. The tube preparation method is 20%TEA (triethanolamine) in water, with this solution applied by pipetting.

### Bias Correction for Diffusion Tubes

Angus Council does not carry out a NO<sub>2</sub> diffusion tube collocation study and therefore a local bias adjustment factor cannot be calculated. However, Fife Council and Dundee Council carry out collocation studies and use Tayside Scientific Services for the supply and analyses of their diffusion tubes. Both Councils submit their diffusion tube data to the Review and Assessment Helpdesk bias adjustment factor calculation spreadsheet<sup>5</sup>, developed by Air Quality Consultants Ltd. In addition, data is also submitted to the Helpdesk by the AEA laboratory inter-comparison scheme, which gives a total of up to three co-location studies for the calculation of a final bias adjustment factor. Table 3, below, summarises the bias adjustment factors derived for 2006 and 2007.

**Table 3 Calculated Bias Adjustment Factors for 2006 and 2007**

Study	Calculated Adjustment Factor	
	2006	2007
AEA Intercomparison	0.91	0.87
Dundee City Council	0.69	-
Fife Council	0.76	1.23
<b>Overall Factor</b>	<b>0.78</b>	<b>1.03</b>

As can be seen, a high factor of 1.23 submitted by Fife Council in 2007 has resulted in a high overall factor when compared to previous years. However, as a result of advice obtained from the Review and Assessment Helpdesk<sup>6</sup>, managed by the University of the West of England (UWE), it has been confirmed that it is appropriate to use as many studies as possible for calculating a final bias adjustment factor. A bias adjustment factor of **1.03** has therefore been used for adjusting 2007 data and a factor of **0.78** has been used for adjusting 2006 data.

### 2.2.2 PM<sub>10</sub>

As discussed in Section 2.1, Angus Council use both Partisols and FDMS analysers for the measurement of PM<sub>10</sub> concentrations. Data collection from the Partisol samplers was carried out by Tayside Scientific Services on behalf of Angus Council on a daily basis. Angus Council change the filter cassettes on a two-weekly basis and the samplers are serviced annually by Air Monitors.

Angus Council visit the FDMS analyser on a monthly basis in order to change filters and check analyser diagnostics. Data is collected via automatic telemetry by Air Monitors and is checked daily. This analyser is also serviced on an annual basis.

## 2.3 Nitrogen Dioxide Monitoring Results

The AQS objectives for NO<sub>2</sub> are summarised in Table 4, below.

**Table 4 AQS objectives for NO<sub>2</sub> in Scotland**

Pollutant	Air Quality Regulations and Air Quality (Scotland) Amendment Regulations
	Nitrogen Dioxide

Table 5 summarises the uncorrected and bias adjusted annual average NO<sub>2</sub> concentrations measured in 2006 and 2007 at the 11 diffusion tube sites across Angus and the predicted 2010 concentrations at these locations. As can be seen from the table, all bias adjusted concentrations are significantly below the 2010 AQS objective of 40 µgm<sup>-3</sup> as an annual average. The highest concentration measured during 2007 was measured at Monfieth (M1) at 30.9 µgm<sup>-3</sup> with the lowest concentration measured at Sacone 2 (B3) at 8.2µg m<sup>-3</sup>. Predicted 2010 concentrations also show that the AQS objective is unlikely to be exceeded in 2010 with all measured concentrations being significantly below the 40 µgm<sup>-3</sup> threshold.

**Table 5 Summary of Angus Council Annual Average Diffusion Tube Concentrations**

Site Location	Site Code	Unadjusted 2006 (µg m <sup>-3</sup> )	Bias Adjusted 2006 (µg m <sup>-3</sup> )	Unadjusted 2007 (µg m <sup>-3</sup> )	Bias Adjusted 2007 (µg m <sup>-3</sup> )	Predicted 2010 (µg m <sup>-3</sup> )
Ethie Ter, Arbroath	A1	10.4	8.1	8.8	9.1	8.1
Inchape Rd, Arbroath	A2	11.7	9.1	11.1	11.4	10.2
Abbey Path, Arbroath	A3	19.3	15.1	18.7	19.3	17.3
22 Lordburn, Arbroath	A4	26.6	20.7	24.9	25.6	22.9
High St, Carnoustie	CAR	26.1	20.4	26.0	26.8	24.0
High St, Monfieth	M1	31.5	24.6	30.0	30.9	27.6
High St, Montrose	M2	28.4	22.2	27.9	28.7	25.7
High St, Brechin	B1	19.6	15.3	19.7	20.3	18.2
Sacone 1, Brechin	B2	10.7	8.3	9.3	9.6	8.6
Sacone2, Brechin	B3	10.8	8.4	8.0	8.2	7.3
High St, Forfar	FOR	29.4	22.9	28.1	28.9	25.9
Manse Cl, Kirriemuir	KIR	16.7	13.0	14.7	15.1	13.5

Tables 6 and 7 summarise bias adjusted and unadjusted NO<sub>2</sub> concentrations, respectively, measured at all monitoring locations between 2003 and 2007. When comparing bias adjusted annual average NO<sub>2</sub> concentrations from 2003 to 2007 (Figure 1) it can be seen that NO<sub>2</sub> concentrations in 2007 increased from 2006 levels at all monitoring sites, excluding site B3, with an upward trend in concentrations from 2003 levels being measured at the majority of sites. The highest increase from 2006 levels was measured at site B1, Brechin High St, with an increase of 32.7%. In contrast, when comparing the uncorrected NO<sub>2</sub> concentrations (Table 7 and Figure 2) it can be seen that NO<sub>2</sub> concentrations decreased from 2006 levels at the majority of the monitoring locations in 2007 with concentrations off during 2005 to 2007. The largest decrease was measured at site B3 with a decrease of 25.9%.

### 2.3.1 NO<sub>2</sub> Trends

Figure 3 shows the annual mean NO<sub>2</sub> trends in Scotland from 1986 to 2006 for Background concentrations and from 1997 to 2006 for Kerbside and Roadside concentrations. As can be seen, roadside and kerbside concentrations of NO<sub>2</sub> in Scotland have continued to decrease up to 2003 and are now levelling off post 2003. When comparing this national trend to the NO<sub>2</sub> trends, illustrated in Figures 1 and 2, it becomes apparent that the unadjusted diffusion tube data (Figure 2) agrees more closely to the national trend than the bias adjusted data (Figure 1). This result can likely be attributed to the use of 1.03 as the bias adjustment factor for correcting the 2007 data, which is significantly higher than the factors used in previous years. However, as discussed in Section 2.1.1, it has been concluded that it is appropriate to use this bias adjustment factor for this report. The trends in NO<sub>2</sub> will be assessed further in the next Updating & Screening Assessment to be produced in 2009.

**Table 6 Bias Adjusted Annual Average NO<sub>2</sub> Concentrations from 2003 – 2007 (µg m<sup>-3</sup>)**

Site Location	Site Code	2003 (0.81)*	2004 (0.83)*	2005 (0.73)*	2006 (0.78)*	2007 (1.03)*	% Change Between 2006 and 2007	2003 – 2007 Mean	% Change Between 2003-2007 mean and 2007
Ethie Ter, Arbroath	A1	-	7.1	7.4	8.1	9.1	11.7	7.9	14.4
Inchape Rd, Arbroath	A2	-	8.4	8.5	9.1	11.4	25.3	9.4	22.2
Abbey Path, Arbroath	A3	16.0	13.7	13.7	15.1	19.3	27.9	15.5	24.1
22 Lordburn, Arbroath	A4	-	18.4	19.9	20.7	25.6	23.6	21.2	21.0
High St, Carnoustie	CAR	18.5	19.5	18.5	20.4	26.8	31.5	20.7	29.1
High St, Monifieth	M1	18.5	22.0	22.6	24.6	30.9	25.8	23.7	30.3
High St, Montrose	M2	16.4	19.8	19.9	22.2	28.7	29.7	21.4	34.4
High St, Brechin	B1	12.7	13.1	14.4	15.3	20.3	32.7	15.2	33.9
Sacone 1, Brechin	B2	-	8.5	8.9	8.3	9.6	14.8	8.8	8.6
Sacone2, Brechin	B3	-	8.9	9.1	8.4	8.2	-2.2	8.6	-4.7
High St, Forfar	FOR	19.1	19.5	19.4	22.9	28.9	26.2	22.0	31.7
Manse Cl, Kirriemuir	KIR	11.3	10.4	11.4	13.0	15.1	16.2	12.3	23.6

\*Bias adjustment factor used for correcting NO<sub>2</sub> diffusion tube data.

**Table 7 Unadjusted Annual Average NO<sub>2</sub> Concentrations from 2003 – 2007 (µg m<sup>-3</sup>)**

Site Location	Site Code	2003	2004	2005	2006	2007	% Change Between 2006 and 2007	2003 – 2007 Mean	% Change Between 2003-2007 mean and 2007
Ethie Ter, Arbroath	A1	-	8.6	10.1	10.4	8.8	-15.4	9.5	-7.1
Inchape Rd, Arbroath	A2	-	10.1	11.6	11.7	11.1	-5.1	11.1	-0.2
Abbey Path, Arbroath	A3	19.7	16.5	18.7	19.3	18.7	-3.1	18.6	0.6
22 Lordburn, Arbroath	A4	-	22.2	27.3	26.6	24.9	-6.4	25.3	-1.4
High St, Carnoustie	CAR	22.9	23.5	25.4	26.1	26.0	-0.4	24.8	4.9
High St, Monifieth	M1	22.8	26.5	31.0	31.5	30.0	-4.8	28.4	5.8
High St, Montrose	M2	20.2	23.8	27.3	28.4	27.9	-1.8	25.5	9.3
High St, Brechin	B1	15.7	15.8	19.7	19.6	19.7	0.5	18.1	8.8
Sacone 1, Brechin	B2	-	10.2	12.2	10.7	9.3	-13.1	10.6	-12.3
Sacone2, Brechin	B3	-	10.7	12.4	10.8	8.0	-25.9	10.5	-23.6
High St, Forfar	FOR	23.6	23.5	26.6	29.4	28.1	-4.4	26.2	7.1
Manse Cl, Kirriemuir	KIR	14.0	12.5	15.6	16.7	14.7	-12.0	14.7	0.0

Figure 1 Bias Adjusted Annual Average NO<sub>2</sub> Concentrations from 2003 – 2007 (µg m<sup>-3</sup>)

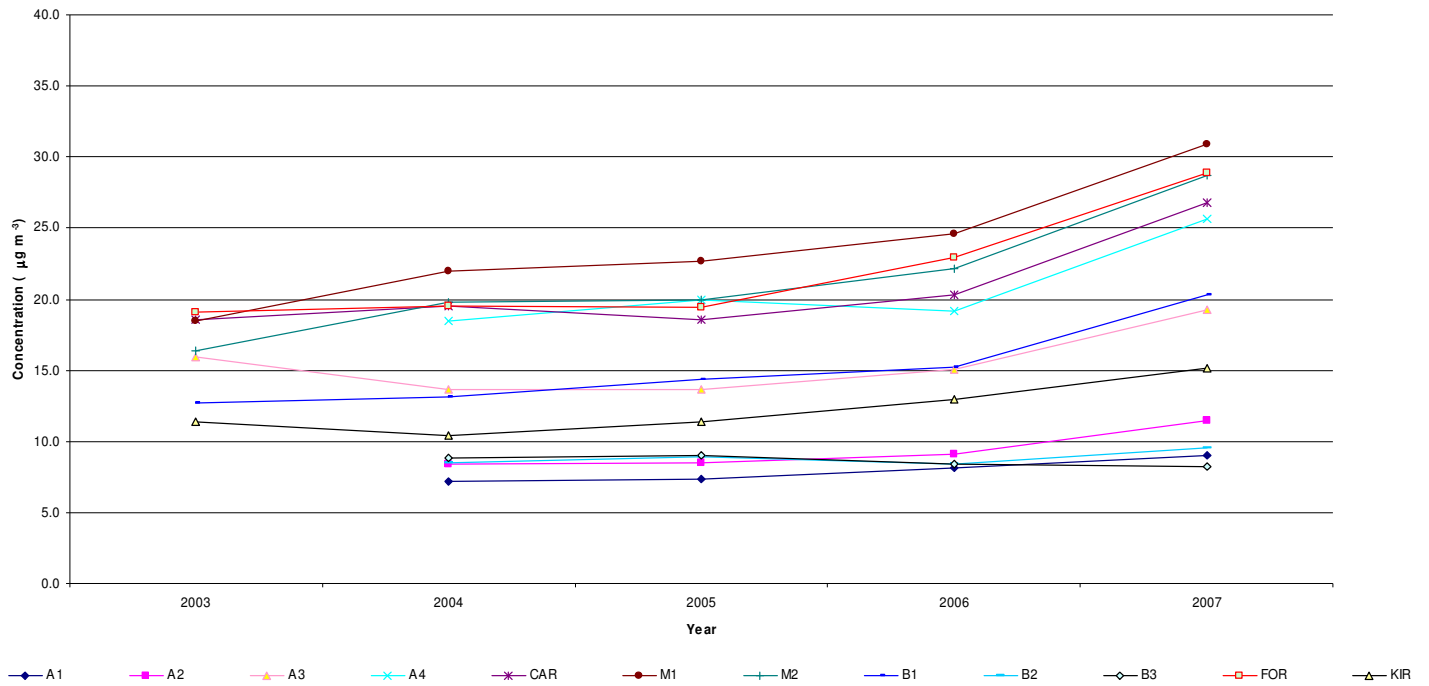


Figure 2 Unadjusted Annual Average NO<sub>2</sub> Concentrations from 2003 – 2007 (µg m<sup>-3</sup>)

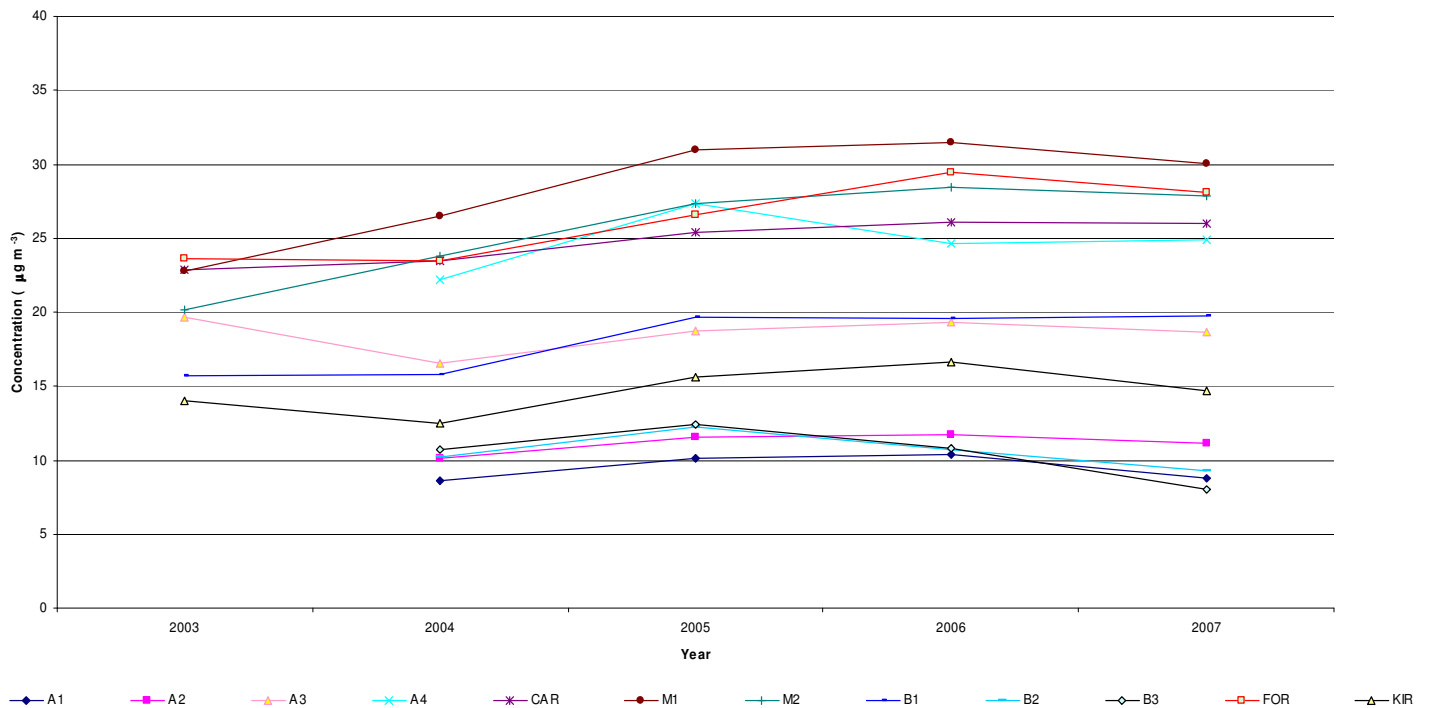
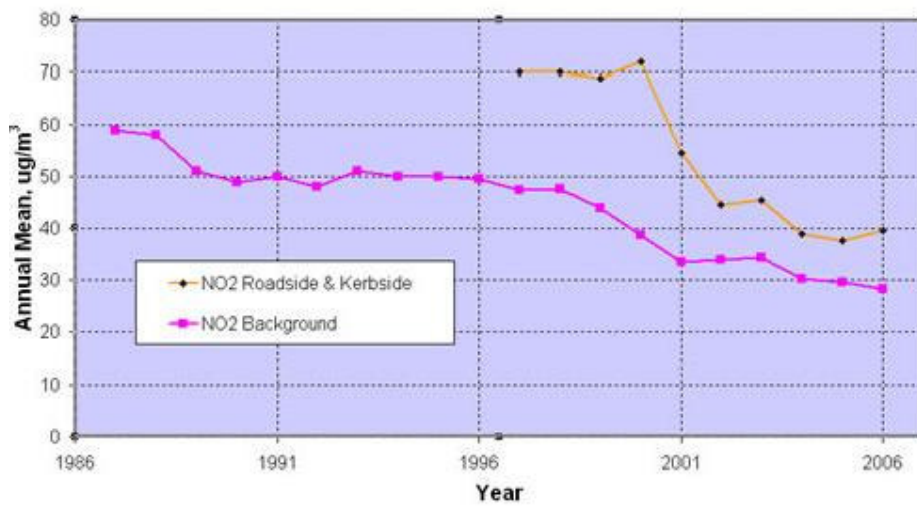


Figure 3 Annual Mean NO<sub>2</sub> Trends in Scotland<sup>7</sup> 1986 – 2006.



## 2.4 Conclusions of the NO<sub>2</sub> Assessment

Therefore, using all available information contained within this report, it has been concluded that Angus Council are not required to proceed to a Detailed Assessment for NO<sub>2</sub>. However, it is recommended that current NO<sub>2</sub> monitoring should be maintained to allow continued assessment of NO<sub>2</sub> concentrations and trends in future years.

## 2.5 PM<sub>10</sub> Monitoring Results

The AQS objectives for PM<sub>10</sub> are summarised in Table 8, below.

**Table 8 AQS Objectives for PM<sub>10</sub> in Scotland**

Pollutant	Air Quality Regulations and Air Quality (Scotland) Amendment Regulations
	Annual mean > 18 µg m <sup>-3</sup> Daily mean > 50 µg m <sup>-3</sup> not to be exceeded more than 7 times in a year

Angus Council currently monitor PM<sub>10</sub> at three locations throughout Angus. Table 9 summarises the site details and data capture of the three monitoring sites. As can be seen, CAR2 achieved a data capture of 91.5% and FOR2 (Gravimetric), FOR2 (FDMS) and G1 one achieved a data capture of 73.2%, 46.9% and 72.6%, respectively. The FOR2 (FDMS) monitoring site was installed in July 2007, which resulted in a low overall data capture in 2007.

**Table 9 Summary of PM<sub>10</sub> Monitoring in Angus 2007**

Site	Site Code	Classification	Data Capture (%)	Measured Concentration (µg m <sup>-3</sup> )	No. Daily Exceedences
Forfar (Grav)	FOR 2	Roadside	73.2	18.9	19
Forfar (FDMS)	FOR 2	Roadside	46.9	15.0	1
Carnoustie	CAR 2	Roadside	91.5	16.1	4
Glenisla	G1	Rural Background	72.6	6.7	0

Table 9 shows that the annual and daily PM<sub>10</sub> objectives were exceeded at site FOR2 (Grav) with a measured annual average concentration of 18.9 µg m<sup>-3</sup> and 19 exceedences of the daily mean objective. Figures 4, 5 and 6 show time-series plots of daily average PM<sub>10</sub> concentrations during 2007 at FOR2 (Grav), CAR2 and G1 respectively. As can be seen from Figure 4, 12 exceedences of the daily objective measured at FOR2 (Grav) were measured during 20<sup>th</sup> February 2007 to 5<sup>th</sup> March 2007 an additional 5 exceedences were measured during 25<sup>th</sup> – 30<sup>th</sup> March 2007. In Figure 5 it can be seen that the daily exceedences measured during 25<sup>th</sup> – 30<sup>th</sup> March 2007 at FOR2 (Grav) were mirrored at the Carnoustie monitoring site (CAR2). However, the earlier exceedences measured in February at FOR2 (Grav) were not measured at any other monitoring site. Therefore, it is difficult to confirm whether the concentrations are representative of PM<sub>10</sub> concentrations in Forfar during that period.

Monitoring of PM<sub>10</sub> at FOR2 using an FDMS commenced in July 2007 and therefore a data capture of only 46.9% was achieved for 2007. In order to estimate an annual average concentration from this short term monitoring period it is necessary to calculate a correction factor as outlined in LAQM.TG(03). Table 10 shows average PM<sub>10</sub> concentrations measured at three monitoring sites in Dundee and Perth during 12/07/07 to 31/12/07 and during the calendar year 2007. A factor was calculated using the ratio between the two period averages. In this case an average factor of **1.05** was calculated for estimating an annual average concentration measured by the FDMS in Forfar. Therefore, the estimated 2007 annual average concentration measured at FOR2 (FDMS) is **15.8 µgm<sup>-3</sup>**, which is significantly below the annual average objective of 18 µgm<sup>-3</sup>. This further demonstrates the possibility that the concentrations measured at FOR2 (Grav) may not be an accurate representation of actual PM<sub>10</sub> concentrations at that site.

**Table 10 Calculated Factors for the Adjustment of Forfar FDMS PM<sub>10</sub> Data 2007**

Monitoring Site	Average PM <sub>10</sub> Concentrations (µg m <sup>-3</sup> )		Factor = Am/Pm
	12/07/07 – 31/12/07 (Pm)	2007 (Am)	
Dundee, Mains Loan	11	11	1.00
Dundee, Broughty Ferry Road	13	14	1.08
Perth, High Street	14	15	1.07
<b>Average Factor (Ra)</b>			<b>1.05</b>

Figure 4 Time-series Plot of Daily PM<sub>10</sub> Averages at Forfar (Gravimetric) - 2007

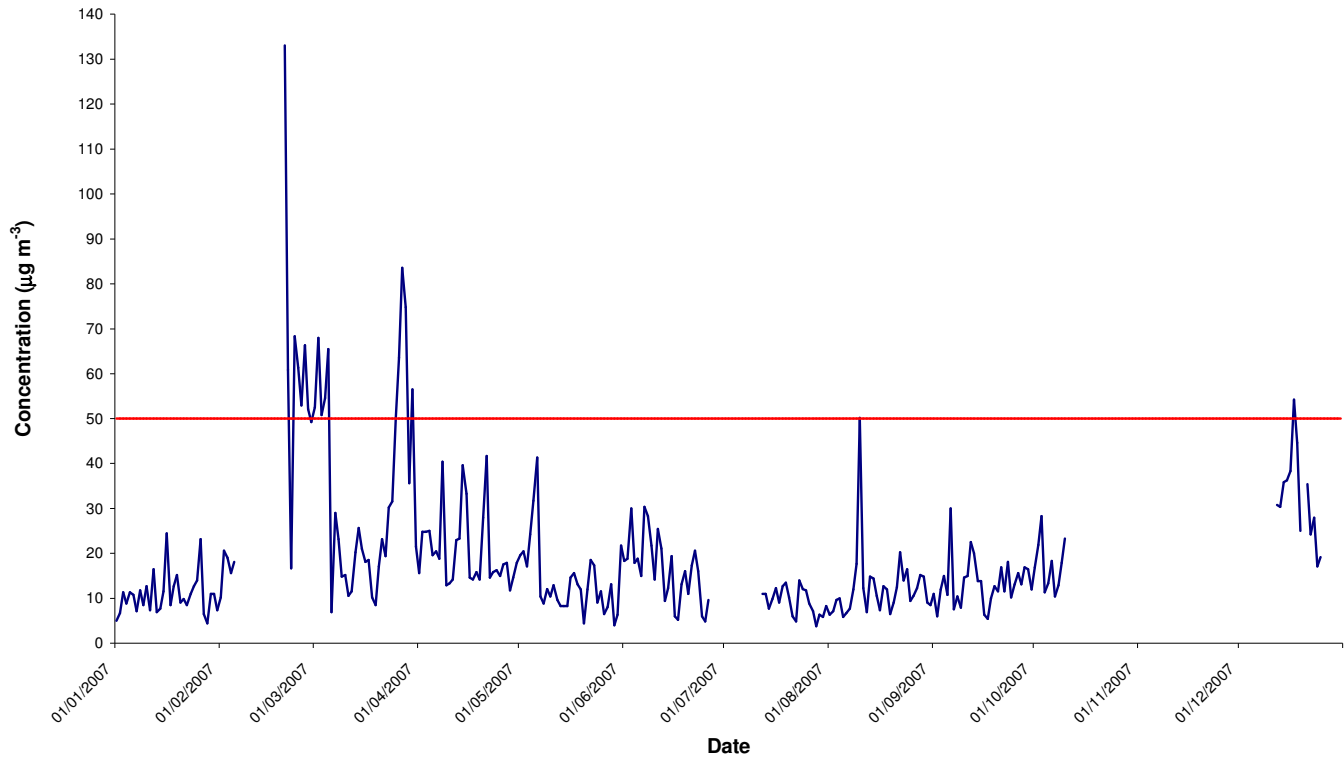
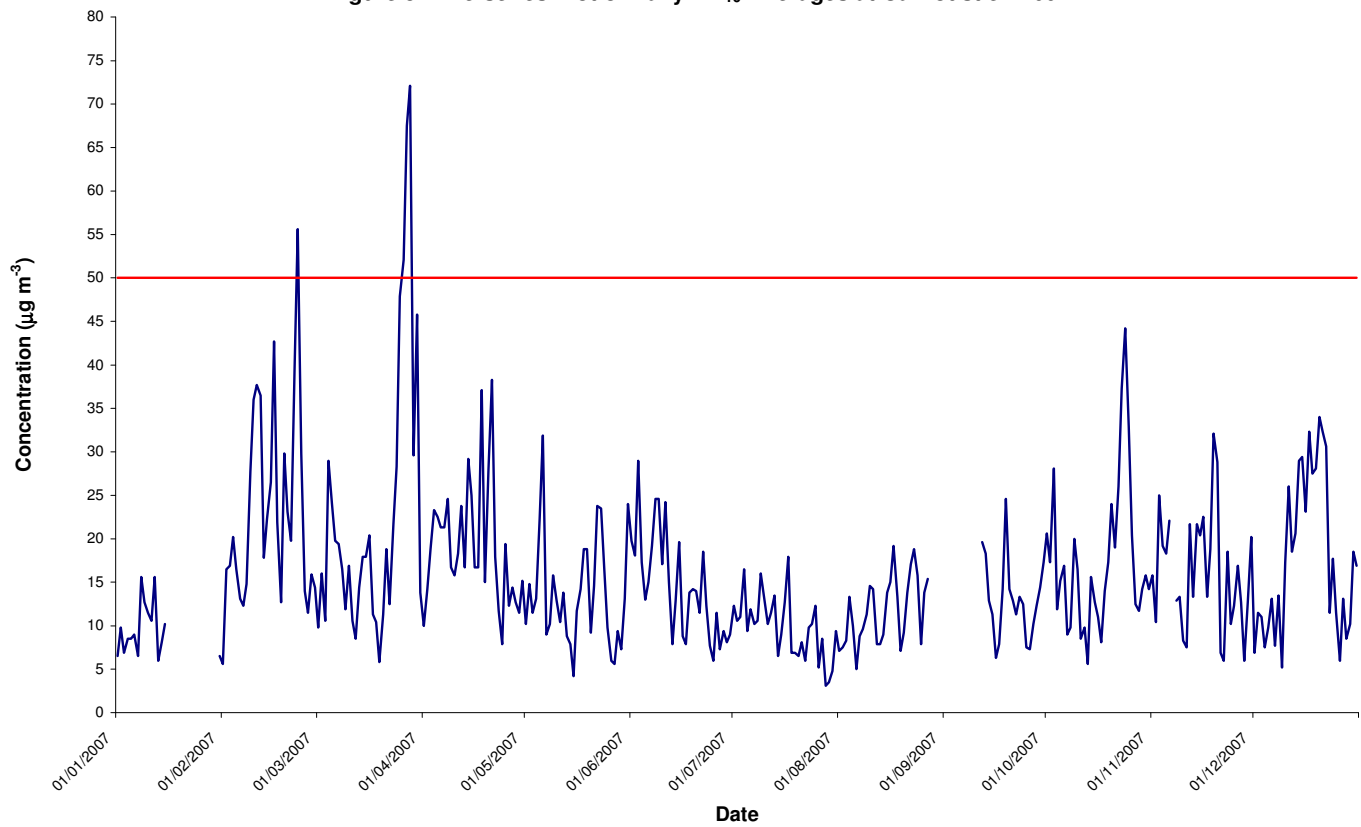


Figure 5 Time-series Plot of Daily PM<sub>10</sub> Averages at Carnoustie - 2007



**Figure 6 Time-series Plot of Daily PM<sub>10</sub> Averages at Glenisla - 2007**

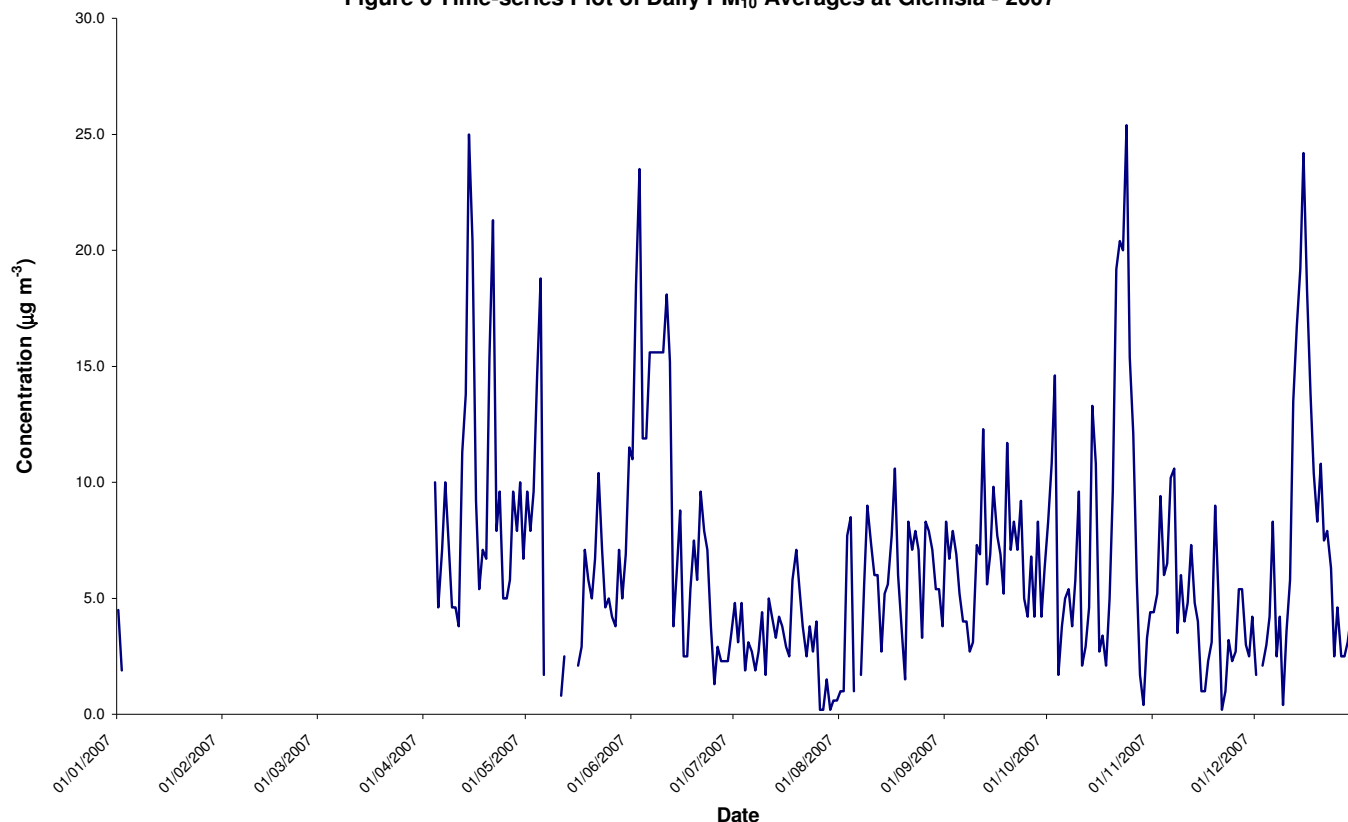


Table 11 summarises annual mean PM<sub>10</sub> concentrations from the installation of the FDMS in Forfar on 12<sup>th</sup> July 2007. During this period no exceedences of the PM<sub>10</sub> objectives were measured. The highest annual average was measured at FOR2 (Grav) with a measured concentration of 17.4 µg m<sup>-3</sup> and four daily exceedences. In contrast, the FDMS at FOR2 measured an annual average concentration of 15 µg m<sup>-3</sup> and only one daily exceedence.

**Table 11 Summary of PM<sub>10</sub> Monitoring in Angus, 12/07/2007 to 11/07/2008**

Site	Site Code	Classification	Data Capture (%)	Measured Concentration (µg m <sup>-3</sup> )	No. Daily Exceedences
Forfar (Grav)	FOR 2	Roadside	79.5	17.4	5
Forfar (FDMS)	FOR 2	Roadside	98.8	15.0	1
Carnoustie	CAR 2	Roadside	89.3	14.7	2
Glenisla	G1	Rural Background	98.6	6.5	0

Projected annual mean PM<sub>10</sub> concentrations and estimated number of daily exceedences for 2010 are presented in Table 12 and have been calculated using the method outlined in Technical Guidance LAQM.TG(03). It is projected that the annual mean objective will not be met at site FOR2 (Grav) in 2010 but that the daily mean objective is unlikely to be exceeded. However, as discussed earlier in this section, it has been advised that the exceedence measured at this site may not be a true representation of PM<sub>10</sub> concentrations in Forfar. No exceedences were detected in PM<sub>10</sub> concentrations measured during 12<sup>th</sup> July 2007 to 11<sup>th</sup> July 2008. In addition, it has been concluded in the 2007 Detailed Assessment that although PM<sub>10</sub> concentrations at Forfar were close to exceeding the annual mean objective, it was predicted that PM<sub>10</sub> concentrations would decrease to below this objective by 2010.

**Table 12 Projected 2010 PM<sub>10</sub> Concentrations**

Site	Site Code	Classification	Measured Concentration 2007 (µg m <sup>-3</sup> )	Projected 2010 Concentrations (µg m <sup>-3</sup> )	Estimated no. of Daily Exceedences >50 µg m <sup>-3</sup>
Forfar (Grav)	FOR 2	Roadside	18.9	18.1	<2
Forfar (FDMS)	FOR 2	Roadside	15.0*	14.4	<1
Carnoustie	CAR 2	Roadside	16.1	15.4	<1
Glenisla	G1	Rural Background	6.7	6.4	0

\*Estimated annual average concentration using the calculated correction factor in Table 10.

## 2.5.1 PM<sub>10</sub> Trends

Prior to the installation of the FDMS analyser at Forfar (FOR2) in July 2007, a TEOM analyser was used at locations in Carnoustie, Ferryden and Forfar. This analyser was shared with Perth and Kinross Council, Dundee City Council and Fife Council and rotated on a three-monthly basis until 2004. Between 2004 and 2006 a six-monthly rotation was employed by the Councils in order to increase the data capture percentage.

The estimated annual mean PM<sub>10</sub> concentrations measured by the TEOM analyser during each period of monitoring between 2000 and 2006 are summarised in Table 13 and are quoted from the LAQM - Detailed Assessment 2007 produced by BMT Cordah Ltd. The estimated annual-mean concentrations were calculated using the method outlined in Technical Guidance LAQM.TG(03). Concentrations measured by the recently installed FDMS analyser are highlighted in bold. It can be seen that measured annual average PM<sub>10</sub> concentrations measured using the TEOM decreased significantly in 2003/4 from 2002 levels where the measured concentrations dropped to 15 µgm<sup>-3</sup> from 27 µgm<sup>-3</sup>. Annual average PM<sub>10</sub> concentrations have now levelled off between 2006 and 2007, which agrees with the national trend where roadside PM<sub>10</sub> concentrations have levelled out since 2001 (shown in Figure 7).

Trends in ozone (O<sub>3</sub>) concentrations in Scotland are also shown in Figure 7, which shows a gradual increase in Rural concentrations and a more dramatic increase in Urban Background concentrations. The increase in Urban Background concentrations is generally thought to be due to a decrease of concentrations of oxides of nitrogen (NO<sub>x</sub>) within urban areas.

**Table 13 PM<sub>10</sub> Concentrations Measured by the TEOM and FDMS Analysers between 2000 and 2007**

Monitoring Period	Period Mean Concentration (µg m <sup>-3</sup> )	Estimated Annual-Mean Concentration (µg m <sup>-3</sup> )
Apr – May 2000 (TEOM)	13	14
Jan – Feb 2002 (TEOM)	24	28
Jul – Aug 2003 (TEOM)	20	24
Nov 2003 – May 2004 (TEOM)	29	27
Oct 2005 – March 2006 (TEOM)	18	15
<b>Jul 2007 – Dec 2007 (FDMS)</b>	<b>15</b>	<b>15.8</b>

As discussed in Section 2.1, gravimetric PM<sub>10</sub> sampling is currently carried out at three locations in Angus at Forfar, Carnoustie and Glenisla. Annual average concentrations sampled at these locations between 2003 and 2007 are shown in Table 14 and graphed in Figure 8. Gravimetric samplers were installed at Carnoustie in 2004 and Glenisla in 2005, therefore, no data are available for these locations before 2004 and 2003 respectively. It can be seen from Figure 7 that PM<sub>10</sub> concentrations measured at Forfar decreased steadily from 2003 to 2005, which agrees with TEOM monitoring discussed above. Again, the gravimetric sampler data from Forfar and Carnoustie suggests that PM<sub>10</sub> concentrations have levelled out during 2005 to 2007, which again mirrors the national trend. The Glenisla monitoring site is classified as Rural Background and therefore PM<sub>10</sub> concentrations measured at that location are not expected to fluctuate greatly, which agrees with the monitoring.

Once again, it is important to highlight the conclusion of the 2007 Detailed Assessment, which concluded that although PM<sub>10</sub> concentrations measured at the Forfar site are approaching the AQS annual mean objective, it is predicted that PM<sub>10</sub> levels will decrease and therefore no exceedences will be measured in 2010.

Figure 7 Provisional Annual Mean PM<sub>10</sub> and Ozone Trends in Scotland<sup>7</sup> 1987 – 2006

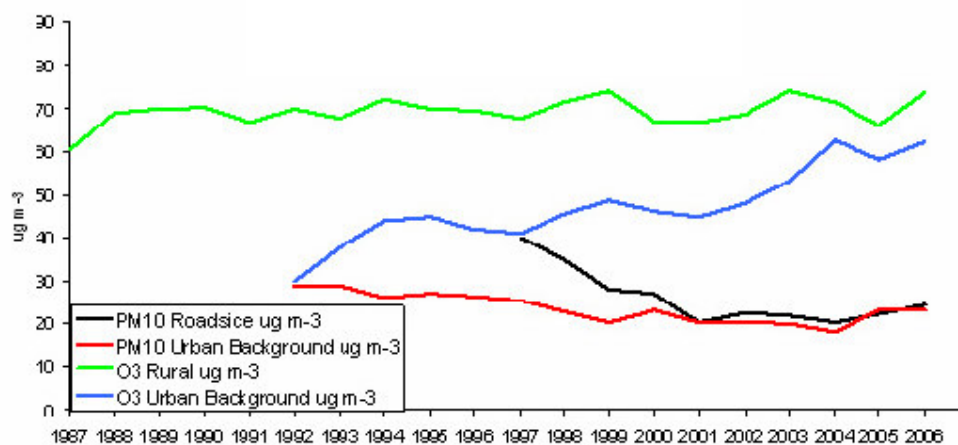
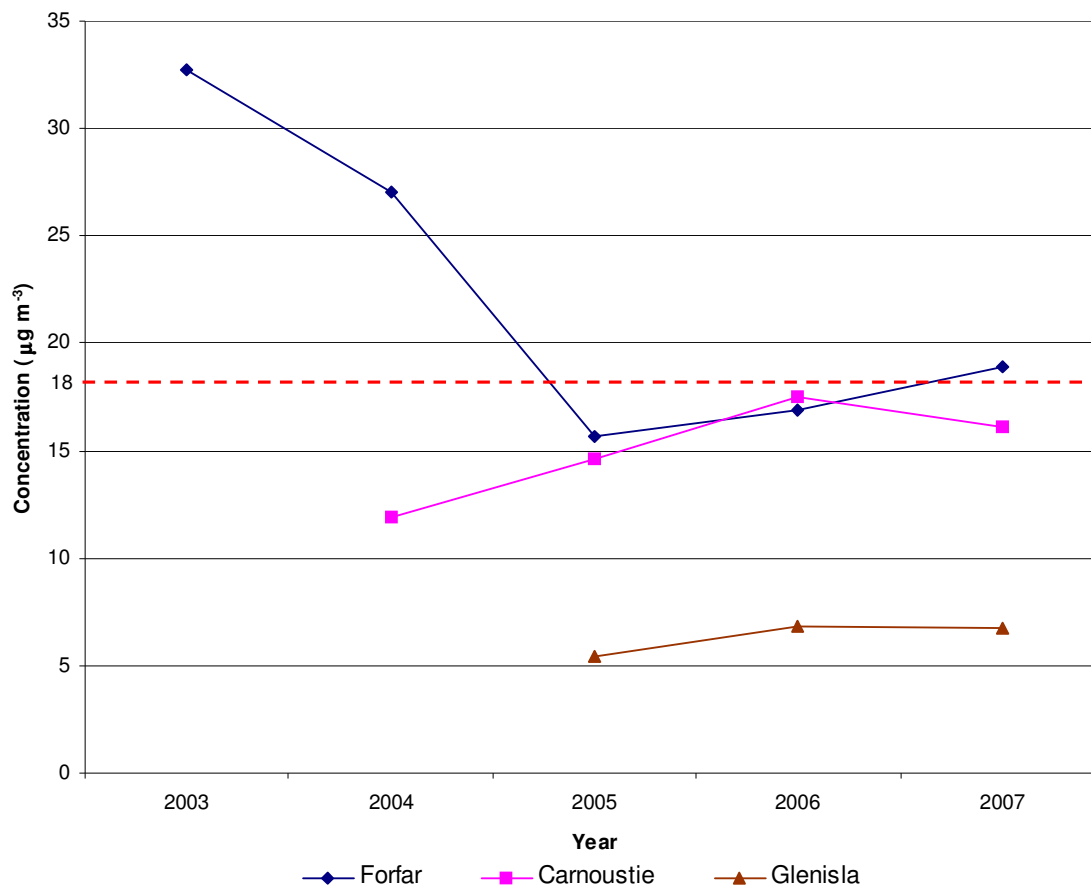


Table 14 Gravimetric PM<sub>10</sub> Monitoring 2003 – 2007 ( $\mu\text{g m}^{-3}$ )

Site Location	Site Code	2003	2004	2005	2006	2007	% Change Between 2006 and 2007	2003 – 2007 Mean	% Change Between 2003-2007 and 2007
Chapel Park Primary School, Forfar	FOR2	32.7	27.0	15.7	16.9	18.9	11.8	22.2	-15.0
Kinloch Primary School, Carnoustie	CAR2	-	11.9	14.6	17.5	16.1	-8.0	15.0	7.2
Glenisla Primary School, Glenisla	G1	-	-	5.4	6.8	6.7	-1.5	6.3	6.3

Figure 8 Annual Average PM<sub>10</sub> Concentrations in Angus during 2003 – 2007



## 2.6 Conclusions from the PM<sub>10</sub> Assessment

Therefore, using all available information contained within this report, it has been shown that measured PM<sub>10</sub> concentrations at monitoring site FOR2 (Grav) did exceed the annual mean and daily mean objective in 2007. However, it was concluded in the 2007 Detailed Assessment for PM<sub>10</sub> that concentrations will decrease to below the 2010 AQS objectives by 2010. It is therefore recommended that Angus Council maintain their current monitoring programme for PM<sub>10</sub>, which will enable the Council to confirm the conclusions of the 2007 Detailed Assessment.

### 3 New Developments

The purpose of this section of the Progress Report is to identify any new developments that may have an affect on air quality within Angus. Items included in this section are:

- New industrial developments;
- New transport, commercial and residential developments;
- New quarry and landfill developments.

#### 3.1 New Industrial Developments

A list of regulated industrial processes (Part A or B) for atmospheric pollutants is presented in Table 15. Table 16 lists all IPPC (Integrated Pollution Prevention and Control) regulated industrial processes within the Angus Council area. All new PPC (Pollution Prevention and Control) permits granted since the 2006 Updating and Screening Assessment (USA) are highlighted in bold. There have been no new IPPC permits granted since the 2006 USA.

The changes in industrial emissions within the Angus Council area predicted to have an insignificant impact on air quality and the current monitoring programme maintained by Angus Council will be sufficient to identify any changes in NO<sub>2</sub> and PM<sub>10</sub> concentrations. It is also recommended that it is not necessary for Angus Council to initiate monitoring of any other AQS pollutants. A more detailed analysis of industrial emissions will be carried out in the next USA, due to be published in 2009.

**Table 15 PPC Regulated Industrial Processes within the Angus Council Area**

Permit/License	NGR	Brief description	PPC Sec. No.	Part A or B	Company
PPC/A/1003221	NO 3864 5375	<b>Part A ENERGY- Manufacture of activated carbon cloth</b>	1.2.h	Part A	<b>Carbon Filter Technology Ltd, Marywell Works, Kirriemuir</b>
PPC/E/20073	<b>NO44284 50183</b>	<b>METALS- Surface treatment of metals</b>	2.3	Part A	<b>Macarron Electroplaters, Orchardbank Ind Est, Forfar, DD8 1UQ</b>
PPC/E/20075	NO 45934 51527	METALS- Surface treatment of metals	2.3	Part A	Forfar Galvanisers Ltd, Carseview Road, Forfar, Angus, DD8 3EE
PPC/A/1004267	NO 58363 52859	CHEMICALS- Converting chemical fertilizers into granules	4.3.b	Part A	Angus Horticulture, Polmood, Guthrie, By Forfar, Angus
PPC/E/20068	NO 52531 48210	OTHER ACTIVITIES- Animal (chicken) Slaughterhouse	6.8.c	Part A	2 Sisters (prev Joseph Mitchell (Letham) Ltd), 2 Woodside Road, Letham, Forfar, DD8 2QD
PPC/E/20078	NO 61349 59549	OTHER ACTIVITIES- Animal Slaughterhouse	6.8.c	Part A	A P Jess (Brechin) Ltd, Brechin Abattoir, Montrose Rd, Brechin, DD9 7PL
PPC/E/20044	NO 6133 5946	<b>Waste Management- Incineration of haz waste (animal carcasses) in co-incineration plant</b>	5.1.b	Part A	<b>Sacone Environmental Ltd, Animal Carcass Incinerator, Montrose Rd, Brechin, DD9 7PL</b>
PPC/A/1003156	NO 5253 4820	Waste Management- Incineration of non haz waste in co-incinerator plant (animal carcass incinerator)	5.1.e	Part A	Joseph Mitchell (Letham) Ltd, 2 Woodside Road, Letham, Forfar, DD8 2QD
PPC/E/30055	NO 3805 5477	Vehicle resprayer	6.4.b	Part B	Paragon (previously Car Transporter Services Northern Ltd & Richard Lawson Autologistics Ltd), Hillhead, Northmuir, Kirriemuir DD8 4PB

Permit/License	NGR	Brief description	PPC Sec. No.	Part A or B	Company
PPC/E/30052	NO 48743 33967	Cement Batching , Roadstone Coating, Crushing	3.1.a.(ii), 3.5.c, 3.5.e	Part B	Ennstone Thistle, Ethiebeaton Quarry
PPC/E/30059	NO 63175 49280	Roadstone Coating	3.5.e	Part B	D Geddes Waulkmill Quarry Roadstone Coating Plant, By Inverkeilor, Dd11 4ut
PPC/B/1003161	NO 61444 48810	Crematoria	5.1 c	Part B	Parkgrove Crematorium, Douglasmuir, Frionckheim, DD11 4UN
PPC/E/30058	NO 71587 60328	Spray > 5t organic solvents	6.4.c.(iii)	Part B	Gemini Corrosion, Brent Avenue, Forties Road Industrial Estate, Montrose, Angus, DD10 9PB
PPC/E/30089	NO 68600 53057	Spray > 5t organic solvents	6.4.c.(iii)	Part B	Tayblast Services Ltd, Lunan Bay Corrosion Centre, Lunan Bay, By Montrose, Angus
PPC/E/30057	NO 62395 40144	Vehicle resprayer	6.4.b	Part B	Tayside Accident Repair, Elliot Industrial Estate, Arbroath, Angus, DD11 2NJ
PPC/E/30060	NO 63399 67692	Timber activities	6.6.(i)	Part B	Rosehill Timber, Clearymoor Sawmill, Rosehill, Northwaterbridge, Aberdeenshire, AB30 IQD
PPC/B/1004860	NO 46024 50632	Petroleum	1.2 c(ii)	Part B	Lothian & Borders & Angus Coop, Abbeygate Petrol Station, Academy St, Forfar
<b>PPC/B/1004716</b>	<b>NO 47940 31598</b>	<b>Petroleum</b>	<b>1.2 c(ii)</b>	<b>Part B</b>	<b>Brochtay Service Station, Esso Petrol Station, Dalhousie Road, Broughty Ferry</b>
PPC/B/1004870	NO 45350 50970	Petroleum	1.2 c(ii)	Part B	Shell Uk Ltd Petrol Station, Queenswell Rd, Forfar
PPC/B/1004852	NO 38409 53356	Petroleum	1.2 c(ii)	Part B	Autosales, Lindsay St, Kirriemuir
PPC/B/1004877	NO 6286 6480	Petroleum	1.2.c.(ii)	Part B	Stracathro Petrol Station, Stracathro
PPC/B/1004878	NO 7103 5735	Petroleum	1.2.c.(ii)	Part B	Shell South Esk Petrol Station, Bridge Street, Montrose
PPC/B/1004680	NO 59710 60550	Petroleum	1.2 c(ii)	Part B	Brechin Service Station, Clerk Street, Brechin
PPC/B/1004868	NO 6473 4246	Petroleum	1.2.c.(ii)	Part B	Strathtay Retail Ltd, Golden Lion Petrol Station, Montrose Rd, Arbroath
PPC/B/1004874	NO 62799 41790	Petroleum	1.2.c.(ii)	Part B	Cairnie Road Petrol Station Arbroath
PPC/B/1004715	NO 64042 41245	Petroleum	1.2 c(ii)	Part B	Morrisons Petrol Station, Hume Street, Arbroath
PPC/B/1004864	NO 7163 5924	Petroleum	1.2.c.(ii)	Part B	Esso, Guthrie Bros (Craigio) Ltd Petrol Station, 108-126 Northesk Road Montrose
<b>PPC/B/1018959</b>	<b>NO 49788 32541</b>	<b>Petroleum</b>	<b>1.2.c.(ii)</b>	<b>Part B</b>	<b>Ospray Forecourts, Monifieth Petrol Station, Monifieth</b>
<b>PPC/B/1019517</b>	<b>NO 5651 3461</b>	<b>Dry Cleaner</b>	<b>7</b>	<b>Part B</b>	<b>Perfect Laundry &amp; Dry Cleaners, 18 High Street, Carnoustie, DD7 6AQ</b>
<b>PPC/B/1017137</b>	<b>NO 7163 5791</b>	<b>Dry Cleaner</b>	<b>7</b>	<b>Part B</b>	<b>New Wynd Laundry, 66 New Wynd, Montrose, Angus, DD10 8RF</b>
<b>PPC/B/1014546</b>	<b>NO 6400 4126</b>	<b>Dry Cleaner</b>	<b>7</b>	<b>Part B</b>	<b>Wm Morrison Supermarkets Plc, Hume Street, Arbroath, Angus, DD11 1UH</b>

Table 16 IPPC Regulated Industrial Processes within the Angus Council Area

Permit/License	Brief description	IPPC Code	PPC Sec. No.	Company
IPC/021 - 29 - 47 - 48 -49/1994, IPC/069/1993	Installations using a chemical or biological process for the production of basic pharmaceutical products  Producing pharmaceutical products using a chemical or biological process	4.5	4.5a	GLAXO OPERATIONS UK LTD COBDEN STREET MONTROSE ANGUS DD10 8EA

## 3.2 New Transport Developments

### New Road Developments

Due to ongoing issues with Angus Council's permanent classified traffic counters, no counts have taken place since 2006. However, it is predicted that the traffic flows within Angus have not significantly changed since 2006 where the average % AADT change per year in the period 2001 - 2006 was 2.9%.

No further roads with a AADT flow greater than 10,000 vehicles per day or roads with HDV flows greater than 2,000 veh/day have been identified since the Updating and Screening Assessment report. The most recent significant road development in Angus was the conversion of the A92 from Arbroath to Dundee to a dual carriageway, which was completed in September 2005.

No roads with a AADT flow greater than 10,000 vehicles per day experienced an increase in flow greater than 25% since the Updating and Screening Assessment report.

### Trains

No new locations have been identified where trains are stationary with engines running for more than 15 mins.

### Airports

There are no significant changes to report since the Updating and Screening Assessment report.

### Bus stations

There are no significant changes to report since the last Updating and Screening Assessment report.

### Shipping

There are no significant changes to report since the last Updating and Screening Assessment report.

### Petrol stations

There are currently 12 petrol stations within the Angus Council area compared with 13 listed in the 2006 USA. The following petrol stations have been installed since the 2006 USA:

- Brochtay Service Station, Esso Petrol Station, Dalhousie Road, Broughty Ferry.
- Ospray Forecourts, Monifieth Petrol Station, Monifieth.

There are no petrol stations located near to a road of 30,000 AADT or greater. Therefore, it is predicted that it is unlikely to be any impact on air quality that could result an exceedence of AQS objectives due to petrol station emissions.

## 3.3 New Commercial and Residential Developments

There have been no new commercial or residential developments during 2007 that may have an impact on air quality within Angus.

## 3.4 New Quarry and Landfill Developments

There have been no new quarry or landfill developments during 2007 that may have an impact on air quality within Angus.

### 3.5 New Biomass Developments

The Scottish Government currently encourages the development of new biomass plants in Scotland. It is hoped that this will lead to a reduction in greenhouse gas emissions within Scotland and will help secure Scotland's energy requirements for future years. Unfortunately, biomass burning result in emissions of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), which lead to an increase in particulate matter (PM) concentrations within populated areas throughout Scotland.

Scotland has adopted challenging air quality objectives to be met by 2010 under the UK Air Quality Strategy. PM<sub>10</sub> objectives are not being met or are close to exceeding in many areas in Scotland and, therefore, any increase in PM emissions within these areas could result in an increase in PM concentrations, which could lead to an increased difficulty in achieving the 2010 objectives. As a result, a balance has to be met between the two targets of reducing greenhouse gas emissions/energy requirements and local air quality management.

A report commissioned by the Scottish Government to study the possible impact of introducing wood-burning biomass boilers into populated areas<sup>9</sup>, more specifically Edinburgh and Dundee, was produced by AEA and published in November 2008. The following conclusion was reached in the study:

*"The modelling study demonstrates that biomass boilers will not be the major source of PM<sub>10</sub> or PM<sub>2.5</sub> in urban areas. However, in areas that are already close to PM<sub>10</sub> Air Quality Objectives the additional contribution of biomass may lead to an exceedence at some city background locations. Note that this result applies to urban background concentrations and higher particle concentrations may be seen in areas close to other specific sources."*

A screening tool has been developed as part of this study to assist Local Authorities in assessing the impact of new biomass boiler applications. The report is available from the Scottish Government at the following link:

<http://www.scotland.gov.uk/Resource/Doc/243574/0067768.pdf>

Currently SEPA are not aware of any biomass boilers in the Angus area that exceed the thresholds (or fuel type) to require regulation. However, installations of wood-burners are proposed for several Angus Council schools and there are currently biomass boilers installed in Tannadice Primary School and Ladyloan Primary School installed in October 2007 and August 2008 respectively. There is also a biomass plant facility in Padanaram, located 2 miles from Forfar, which opened in January of 2008. Current and proposed biomass boilers within the Angus Council area are summarised in Table 17.

**Table 17 Biomass Boilers within the Angus Council Boundary**

Location of Biomass Unit	Operator	Maximum Output (kW)	Start Date
Tannadice Primary School by Brechin	Angus Council	300	10/07
Ladyloan Primary School, Arbroath	Angus Council	250	08/08
Airlie Primary School	Angus Council	110	02/09
Seaview Primary School Monifieth	Angus Council	250	08/09
Padanaram	Wood Energy Ltd	93	01/08

It is recommended that the screening tool be used to assess the possible impact of these installations on PM<sub>10</sub> concentrations. Again, a further and more detailed analysis of the possible air quality impacts will be carried out in the next USA, due to be published in 2009.

## 4 Conclusions

1. Angus Council currently maintains an air quality monitoring network monitoring nitrogen dioxide (NO<sub>2</sub>) using diffusion tubes at 11 locations throughout Angus and PM<sub>10</sub> particulate matter using at three sites. PM<sub>10</sub> monitoring consists of three gravimetric samplers located in Glenisla, Carnoustie and Forfar and a Filter Dynamics Measurement System (FDMS) analyser collocated with the sampler in Forfar.
2. Monitoring of benzene, 1,3 butadiene, carbon monoxide, sulphur dioxide and lead is not carried out by Angus Council. This is as a result of the 2006 Updating and Screening Assessment, which concluded that no Air Quality Strategy (AQS) Objectives for these pollutants were likely to be exceeded. There are no existing or planned developments that could result in any exceedences of the AQS objectives for the abovementioned pollutants.
3. Analysis of NO<sub>2</sub> data for 2007, in this report, shows that there continues to be no exceedence of AQS objectives for this pollutant, and hence, Angus Council are not required to proceed to a Detailed Assessment. However, when using bias adjusted NO<sub>2</sub> concentrations, it can be concluded that NO<sub>2</sub> concentrations may be increasing at the majority of monitoring sites. This is in contrast when uncorrected NO<sub>2</sub> data is used where NO<sub>2</sub> concentrations have levelled out. This discrepancy can be attributed to the use of 1.03 as the bias adjustment factor, which is significantly higher than factors used in previous years. The apparent increase in NO<sub>2</sub> concentrations will therefore need to be confirmed in the next Updating and Screening Assessment, due to be published in 2009.
4. It is therefore recommended that the current NO<sub>2</sub> monitoring programme within Angus should be maintained.
5. Analysis of PM<sub>10</sub> monitoring, in this report, shows that the PM<sub>10</sub> AQS for 2010 annual mean (18 µg m<sup>-3</sup>) and daily mean objectives (50 µg m<sup>-3</sup> not to be exceeded more than 7 times) were exceeded at the Forfar monitoring site in 2007, as measured by the gravimetric sampler. An annual mean concentration of 18.9 µg m<sup>-3</sup> was measured with 19 exceedences of the daily mean objective. However, it has been argued that because 12 of the daily exceedences were measured during 20<sup>th</sup> February 2007 to 5<sup>th</sup> March and the elevated PM<sub>10</sub> concentrations during this period were not mirrored at the Carnoustie monitoring site, there is some doubt that these concentrations are representative of PM<sub>10</sub> levels in Forfar. In contrast, there is good correlation between data from Forfar and Carnoustie monitoring sites during 25<sup>th</sup> to 30<sup>th</sup> March where a number of daily exceedences were measured at both sites. In addition, the collocated FDMS installed in July 2007 measured an estimated annual mean concentration of 15.8 µg m<sup>-3</sup>, which is significantly below the concentrations measured by the gravimetric sampler.
6. Trend analysis of the PM<sub>10</sub> from 2003 in Forfar has shown that PM<sub>10</sub> concentrations dropped sharply between 2003 and 2005 and levelled out up to 2007. This is mirrored at Carnoustie and Glenisla monitoring sites where concentrations have also levelled out from 2005 to 2007.
7. It was concluded in the 2007 Detailed Assessment for PM<sub>10</sub> that although PM<sub>10</sub> concentrations measured at the Forfar gravimetric monitoring site were approaching the AQS objectives, concentrations were predicted to drop and therefore the 2010 objective was unlikely to be exceeded in 2010.
8. A review of new developments that may have an impact on air quality within the Angus area shows that there is no requirement for Angus Council to extend their current monitoring programme.
9. **The review of new information available for 2007 and contained within this report, therefore, confirms the conclusions of the 2006 USA Report for NO<sub>2</sub> that Angus Council is not required to proceed to a Detailed Assessment for NO<sub>2</sub>. This report also confirms the conclusions of the 2007 Detailed Assessment for PM<sub>10</sub> that it is unlikely that the 2010 objective will be exceeded in 2010 in Forfar. However, it is recommended that the current monitoring programme is maintained in order to quantify any changes in NO<sub>2</sub> and PM<sub>10</sub> concentrations that may occur during 2008.**

**Angus Council accepts the above conclusions and will implement the recommendations.**

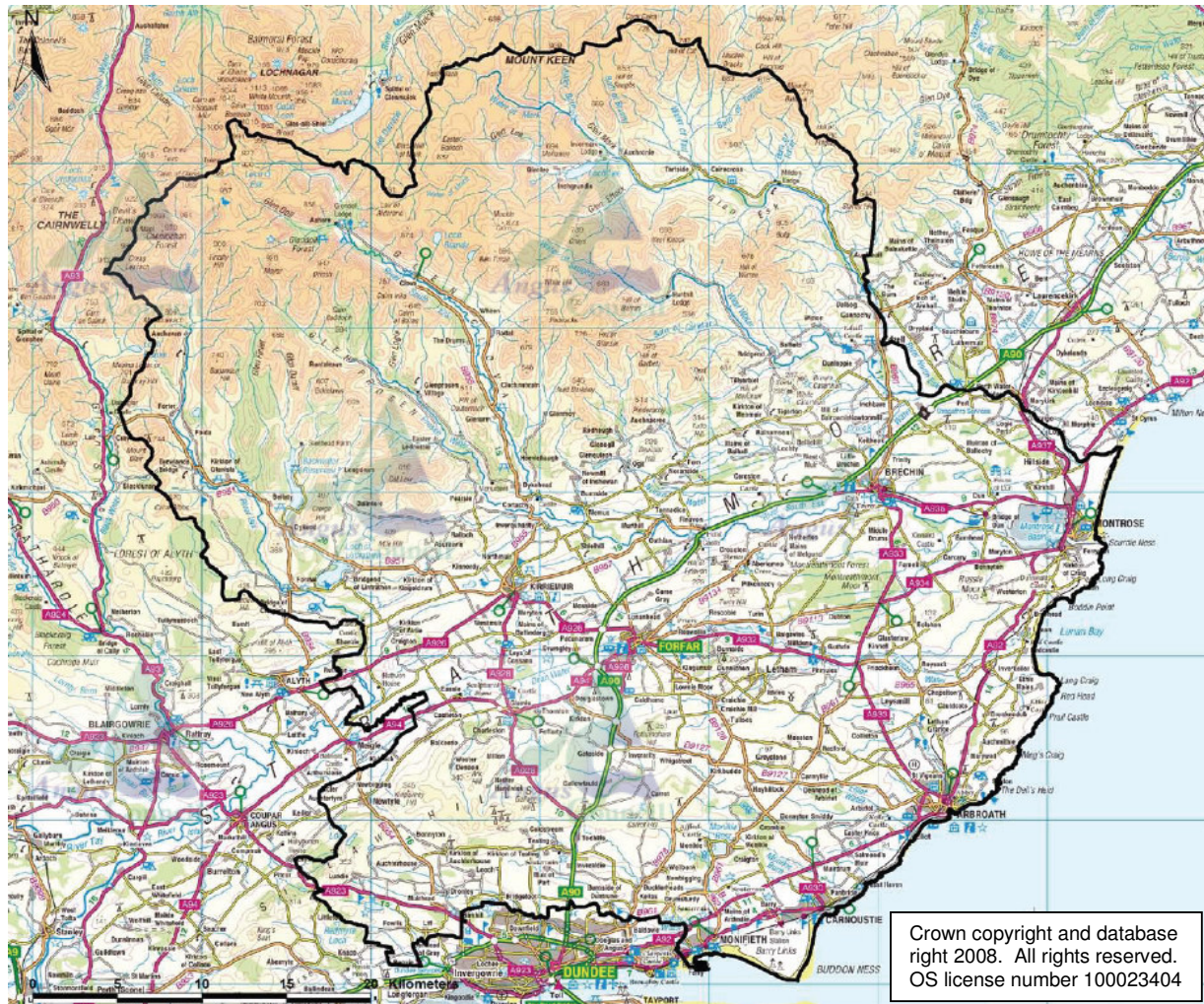
## 5 References

- [1] Part IV of the Environment Act 1995 Local Air Quality management, Progress Report Guidance LAQM PRG (03)
- [2] Local Air Quality Management Detailed Assessment 2007, BMT Cordah Ltd, E\_AGC\_011/Report 2, 4<sup>th</sup> October 2007.
- [3] LAQM Updating and Screening Assessment 2006, BMT Cordah Ltd, E\_AGC\_010/2006, 4<sup>th</sup> July 2006
- [4] Part IV of the Environment Act 1995. Local Air Quality Management. Technical Guidance LAQM.TG(03) January 2003.
- [5] Review and Assessment Helpdesk Diffusion Tube Bias Adjustment Spreadsheet, Air Quality Consultants Ltd, v11/08:  
  
<http://www.uwe.ac.uk/aqm/review/diffusiontube131108.xls>
- [6] Review and Assessment Helpdesk Website, University of the West of England (UWE):  
  
<http://www.uwe.ac.uk/aqm/review>
- [7] The Headline Air Quality Indicator, AEA:  
  
<http://www.scottishairquality.co.uk/trends.php>
- [8] Measurement and Modelling of Fine Particulate Emissions (PM<sub>10</sub> & PM<sub>2.5</sub>) From Wood-Burning Biomass Boilers, AEA, 26<sup>th</sup> September 2008.



# Appendix 1

## Angus Council Boundary





## **Appendix 2**

### **Air Quality Monitoring Site Locations**

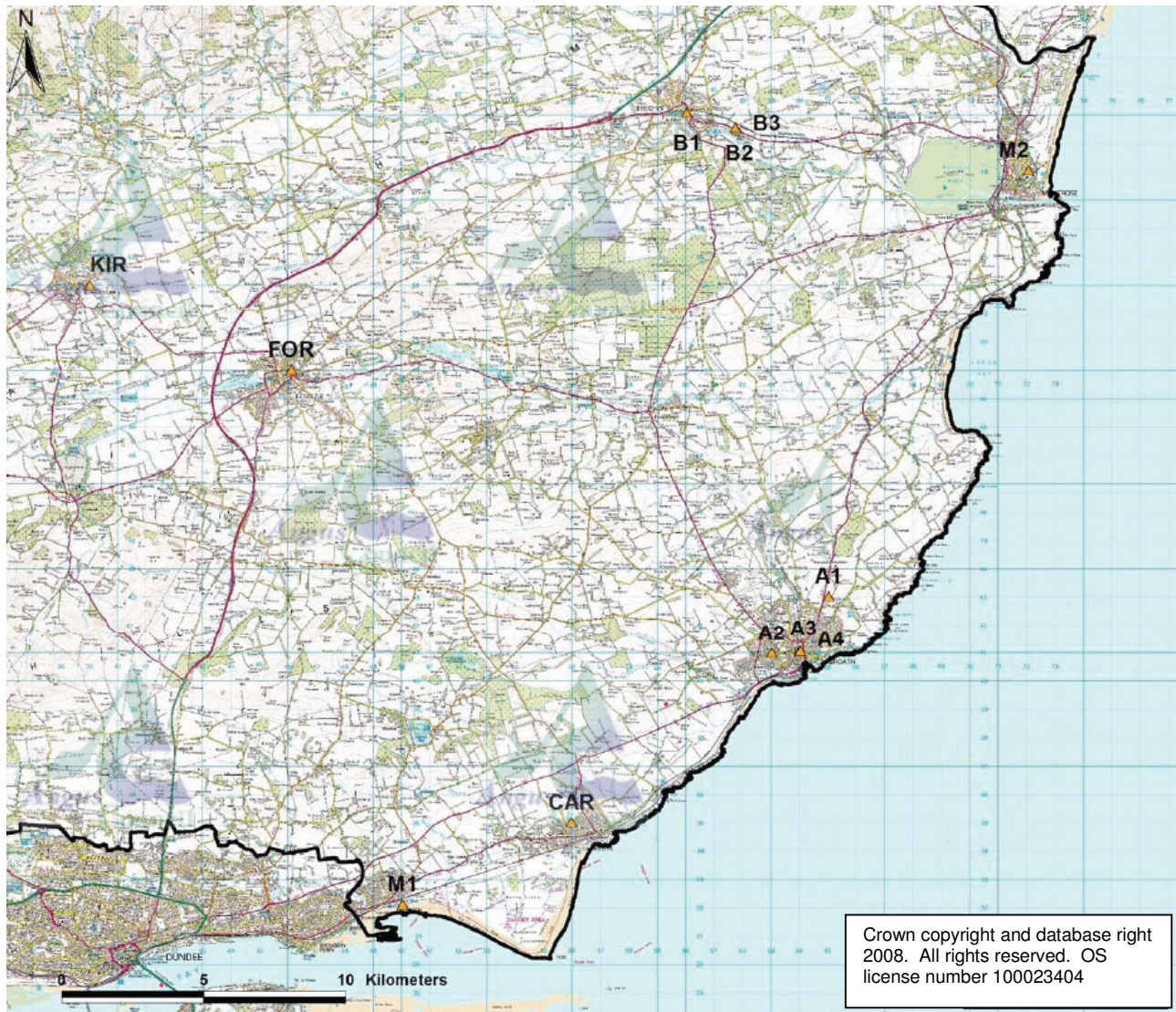
#### **Contents:**

**Figure A2.1 NO<sub>2</sub> Diffusion Tube Monitoring Site Locations**

**Figure A2.2 PM<sub>10</sub> Monitoring Site Locations**



Figure A2.1 NO<sub>2</sub> Diffusion Tube Monitoring Site Locations



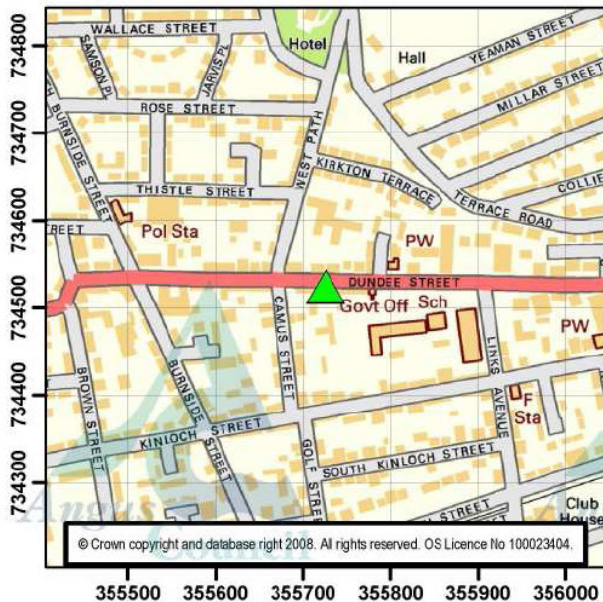
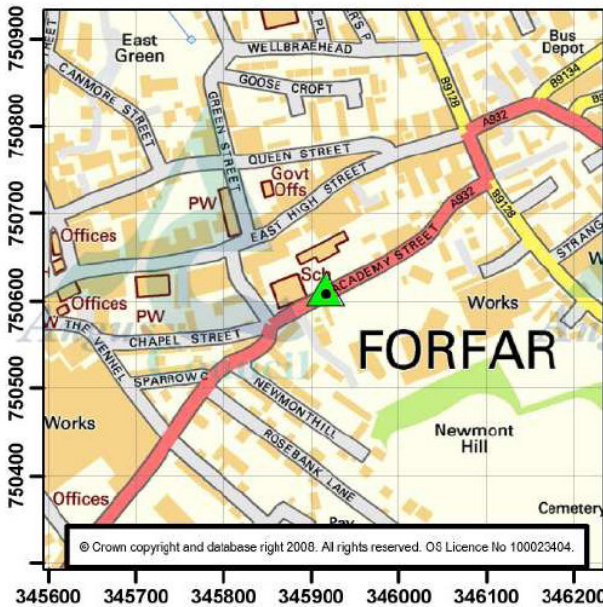
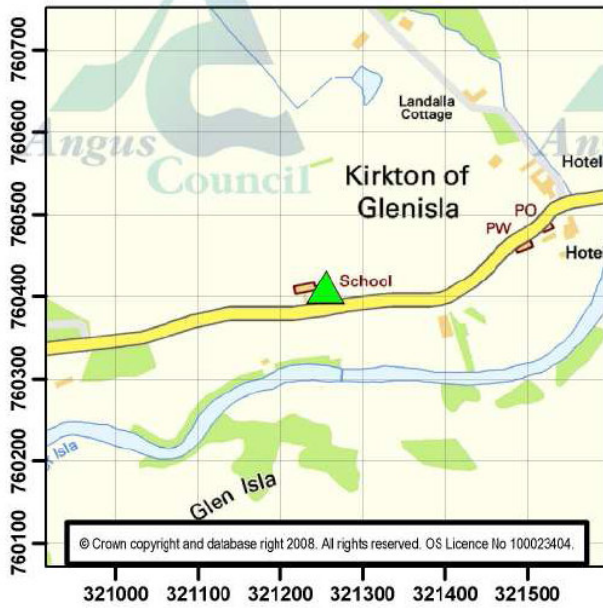
**Legend**

▲ NO<sub>2</sub> Diffusion Tube Sites

- A1. Ethie Ter, Arbroath
- A2. Inchape Rd, Arbroath
- A3. Abbey Path, Arbroath
- A4. 22 Lordburn, Arbroath
- CAR. High St, Carnoustie
- M1. High St, Monifieth
- M2. High St, Montrose
- B1. High St, Brechin
- FOR. High St, Forfar
- KIR. Manse Cl, Kirriemuir
- B2. Sacone 1, Brechin
- B3. Sacone 2, Brechin



Figure A2.2 PM<sub>10</sub> Monitoring Site Locations



**Angus Council Air Quality Monitoring Locations**

**Glenisla Primary School, Glenisla**  
Grid Ref: 321255,760411

**Chapelpark Primary School, Forfar**  
Grid Ref: 345914,750613

**Kinloch Primary School, Carnoustie**  
Grid Ref: 355726,734524

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Lochshore Business Park  
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