

2010 Air Quality Progress Report for *Angus Council*

In fulfillment of Part IV of the Environment Act 1995 Local Air Quality Management

June 2010

Report to Angus Council Unrestricted ED49991 Issue 1 June 2010



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Report Reference number	AEAT/ENV/R/2972/Issue_1
Date	June 2010

Title	2009 Air Quality Progress Report for Angus Council		
Customer	Angus Council		
Customer reference			
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File reference	AEAT/ENV/R/29	972/Issue_1	
Reference number	ED49991		
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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. 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.

Analysis of NO_2 data for 2009, 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 for NO_2 .

Trend analysis of NO₂ data indicates that the underlying trend at all Roadside and Kerbside monitoring locations in Angus is an increase in NO₂ annual mean concentrations between 2003 and 2009 with concentrations remaining relatively unchanged at Urban Background and Industrial monitoring sites.

Analysis of PM_{10} data for 2009, 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 for PM_{10} .

Trend analysis of annual mean PM_{10} concentrations at Forfar, Carnoustie and Glenisla shows that concentrations have remained stable since 2005 with no upward or downward trend, which agrees with the national trend where PM_{10} concentrations are beginning to level out.

A review of traffic, commercial, industrial and domestic developments has identified that there are no new or existing developments that are likely to lead to an exceedence of the AQS objectives for any pollutant.

The review of new monitoring data and new developments available for 2009 and contained within this report confirms the conclusions of the 2009 USA Report for NO_2 and PM_{10} that Angus Council is not required to proceed to a Detailed Assessment . However it is recommended that Angus Council maintain their current monitoring programme.

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1 Introduction

1.1 Description of Angus Council Area

Angus Council area is located on the east coast of Scotland between Dundee City, Perth and Kinross Councils to the south and west, and Aberdeenshire Council to the North. The North Sea forms the eastern coast of the Angus Council area.

Angus can be split into two geographic areas. To the north and west, the topography is mountainous and is sparsely populated with the main industry being hill-farming. To the south and east the topography consists of rolling hills bordering the North Sea. This area is well populated, with the larger towns on the coast.

The main towns within Angus are Forfar, Montrose, Monifieth, Carnoustie, Brechin, Kirriemuir and Arbroath. Angus has an approximate population 110,000 with the three main population centres being Forfar, Arbroath and Montrose. A map of the Angus Council boundary is shown in Figure 1.1.



Figure 1.1 Angus Council Boundary

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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 μ gm⁻³ (milligrammes per cubic metre, m gm⁻³ for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Pollutant	Air Quality	Date to be	
	Concentration	Measured as	achieved by
Benzene			
	16.25 μg/m³	Running annual mean	31.12.2003
	3.25 μg/m ³	Running annual mean	31.12.2010
1,3-Butadiene	2.25 <i>µ</i> g/m ³	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m ³	Running 8-hour mean	31.12.2003
Lead	0.5 μ g/m ³	Annual mean	31.12.2004
	0.25 μ g/m ³	Annual mean	31.12.2008
Nitrogen dioxide	200 μ g/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 μg/m	Annual mean	31.12.2005
Particles (PM ₁₀) (gravimetric)	50 μ g/m ³ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 μg/m ³	Annual mean	31.12.2004
	50 μ g/m ³ , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	το μg/π	Annual mean	31.12.2010
Sulphur dioxide	350 μ g/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 μ g/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 μ g/m ³ , not to be exceeded more than 35 times a year		
		15-minute mean	31.12.2005

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

1.4 Summary of Previous Review and Assessments

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.

Angus Council completed a USA in April 2003¹ The USA concluded that it was unlikely that any AQS objectives would be exceeded within the Angus Council area.

During 2004 Angus Council conducted a review of emissions from domestic sources to address issues raised by the Scottish Environment Protection Agency (SEPA) and the Scottish Government following the USA. The review identified twenty-four communities for which further investigation of fuel types and quantities used at domestic properties was required. SEPA recommended that two or three communities with the greatest density of coal burning be investigated to conserve Council resources. The domestic fuel survey was undertaken in 2005 in Glamis, Newbigging and Auchmithie.

A review of particulates² was conducted in 2004 to assess in detail the emissions and sources of particulate matter (PM₁₀) within the Angus Council area. The review assessed monitoring data, emissions of PM₁₀ from regulated processes and road traffic. The report concluded that the monitoring data and screening assessment criteria provided in the LAQM.TG(03) technical guidance did not correlate well. The monitoring data indicated exceedences of the 2010 AQS objectives for PM₁₀ but the screening criteria indicated that there was unlikely to be an exceedence of the AQS objectives. It was therefore concluded that further investigation was required to identify the sources of PM₁₀ within the Angus Council area.

The Angus Council LAQM Progress Report³ for 2005 reviewed the changes in industrial and domestic sources of pollutants and assessed the updated monitoring data for nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and PM₁₀. The report concluded that there was no potential for the exceedence of the AQS objectives for carbon monoxide (CO), benzene, 1, 3-butadiene, lead, NO2 and SO2. However, based on the Tapered Element Oscillating Monitor (TEOM) results, annual mean concentrations of PM₁₀ were predicted to exceed the 2010 AQS objective at Forfar. It was planned that a Gravimetric partisol sampler would be installed in Forfar to verify the TEOM results. The gravimetric sampler was installed and commenced operation in October 2005. It was also concluded that further assessment of Ethibethean Quarry was required with regards to PM₁₀ emissions and that domestic fuel surveys would be conducted in Auchmithie, Glamis and Newbigging.

The 2006 USA⁴ 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 Assessment⁵ of particulate levels in Forfar in 2007. It was also assessed that the density of coal burning properties was less than 50 properties per 500m² and was therefore unlikely to result in exceedences of the AQS objectives for PM₁₀ or SO₂.

The Detailed Assessment⁵, carried out in 2007, concluded that although the 2010 AQS annual average objective of 18µgm⁻³ was exceeded during the period 1st June 2006 to 31st May 2007 in Forfar, it was predicted that PM₁₀ levels would drop below but be close to this level by 2010.

¹ LAQM Updating and Screening Assessment 2006, BMT Cordah Ltd, E AGC 005/2003, April 2003

² Review of Particulates, BMT Cordah Ltd, AGC.007 / 2004, 22nd October 2004
³ LAQM Progress Report 2005, BMT Cordah Ltd, E_AGC_009/2005, 16th May 2005

⁴ LAQM Updating and Screening Assessment 2006, BMT Cordah Ltd, E_AGC_010/2006, 4th July 2006

⁵ Local Air Quality Management Detailed Assessment 2007, BMT Cordan Ltd, E_AGC_011/Report 2, 4th October 2007

The main sources of PM_{10} 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 PM₁₀.

The 2008 Progress Report⁶ concluded that it was not necessary for Angus Council to proceed to a Detailed Assessment for NO_2 or PM_{10} but that the current monitoring programme should continue in order to quantify any changes in NO_2 and PM_{10} concentrations that may occur during 2008.

The 2009 USA⁷ concluded that Angus Council were not required to proceed to a Detailed Assessment for NO₂. This report also concluded that it was possible that the 2010 annual average objective for PM_{10} could be exceeded in 2010 in Forfar. It was therefore recommended that the current monitoring programme is maintained. In addition, it was also concluded that there were no new or existing sources within Angus that required a Detailed Assessment. However, it was noted that further information is required to assess the combined impacts of biomass burning within Angus.

⁶ Air Quality Review and Assessment Progress Report 2007/8: Angus Council, AEA, AEAT/ENV/R/2725/Issue 2, 2nd February 2009

⁷ 2009 Air Quality Updating and Screening Assessment for Angus Council, AEA, AEAT/ENV/R/2904, 2nd November 2009

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

Angus Council currently carry out air quality monitoring of NO_2 at 11 locations and PM_{10} at 3 locations throughout Angus. The monitoring programme consists of both automatic and non-automatic monitoring methods. The site details are summarised in Table 2.1 with site locations shown in Appendices 1 and 2.

Site Location	Site Code	Grid Reference	Site Classification	Pollutant Monitored	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst- case Location?
Ethie Ter, Arbroath	A1	364600, 742700	Urban Background	NO ₂	Y 0m	1m	Ν
Inchcape Rd, Arbroath	A2	362930, 740684	Urban Background	NO ₂	Y 0m	2m	N
Abbey Path, Arbroath	A3	364200, 741100	Roadside	NO ₂	Y 1.5m	<1m	N
22 Lordburn, Arbroath	A4	364100, 741100	Roadside	NO ₂	Y 3m	<1m	N
High St, Carnoustie	CAR	356000, 735000	Kerbside	NO ₂	Y 3m	2m	N
High St, Monfieth	M1	350000, 732000	Kerbside	NO ₂	Y 0m	2m	Ν
High St, Montrose	M2	732000, 758000	Kerbside	NO ₂	Y 2m	1m	Y
High St, Brechin	B1	360000, 760000	Kerbside	NO ₂	Y 2m	1m	Ν
Sacone 1, Brechin	B2	361000, 780000	Industrial	NO ₂	N	8m	Ν
Sacone2, Brechin	B3	361000, 780000	Industrial	NO ₂	N	60m	N
High St, Forfar	FOR	351000, 746000	Kerbside	NO ₂	Y 3m	<1m	Ν
Manse Cl, Kirriemuir	KIR	339000, 754000	Kerbside	NO ₂	Y 5M	6m	Ν
Chaplepark Primary School, Forfar	FOR2 (Grav)	345914, 750613	Roadside	PM ₁₀	Y 0m	5m	N
Chaplepark Primary School, Forfar	FOR2 (FDMS)	345914, 750613	Roadside	PM ₁₀	Y 0m	6m	Ν
Dundee Street, Carnoustie	CAR 2 (Partisol)	355726, 734524	Roadside	PM ₁₀	Y 8m	3m	Ν
Glenisla Primary School, Glenisla	G1 (Partisol)	321255, 760411	Rural Background	PM ₁₀	Y 0m	20m	N

Table 2.1 Details of Air Quality Monitoring Sites in Angus 2008

 NO_2 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_{10} 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_{10} 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 following AQS pollutants are not monitored by Angus Council:

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

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 also no existing or planned developments that could result in any exceedences of the AQS objectives for the above mentioned pollutants.

2.2 Quality Assurance and Quality Control (QA/QC)

As outlined in Technical Guidance LAQM.TG(09)⁸, 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 NO₂ 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

⁸ Part IV of the Environment Act 1995. Local Air Quality Management. Technical Guidance LAQM.TG(09) February 2009

are compared with those of the automatic chemiluminescent analyser at the site (which is defined as the reference method for NO_2).

3. Every six months a QC NO₂ solution is also provided to Tayside via this contract. This solution is used as an internal check for analysis of NO₂ tubes in the laboratory. Tayside test the QC solution after every 21 NO₂ 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.

2.2.2 Bias Correction for Diffusion Tubes

Angus Council does not carry out a NO₂ diffusion tube collocation study and therefore a local bias adjustment factor cannot be determined. However, Fife Council and Dundee Council carry out collocation studies at three and four sites respectively and use Tayside Scientific Services for the supply and analyses of their diffusion tubes. AEA also carry out a laboratory intercomparison and submit an adjustment factor. Fife Council and AEA have submitted their diffusion tube data to the latest University of the West of England (UWE) Review and Assessment Helpdesk bias adjustment factor calculation spreadsheet⁹ (v03/10), developed by Air Quality Consultants Ltd. Table 2.2, below, summarises the bias adjustment factor derived for 2009 using the UWE spreadsheet. A total of three collocation studies have been submitted, two using Roadside sites (R) and on using a Kerbside site (K).

Analysed By	Method	Year	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (μg/m3)	Automatic Monitor Mean Conc. (Cm) (μg/m3)	Bias (B)	Tube Precision	Bias Adjustment Factor (A) (Cm/Dm)
Tayside SS	20% TEA in Water	2009	R	Fife Council	11	38	28	37.1%	G	0.73
Tayside SS	20% TEA in Water	2009	R	Fife Council	10	33	26	24.4%	G	0.80
Tayside SS	20% TEA in Water	2009	к	AEA Tech Intercomparison	11	139	108	28.5%	G	0.78
Overall Factor (3 Studies):					0.77					

Table 2.2	Calculated Bias	Adjustment	Factors	for 2009
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A bias adjustment factor of **0.77** has therefore been used for adjusting 2009 data. This adjustment factor has been taken from the latest version of the UWE spreadsheet and is correct at the time of writing this report.

2.2.3 PM₁₀

As discussed in Section 2.1, Angus Council use both Partisols and FDMS analysers for the measurement of PM₁₀ concentrations. Data collection from the Partisol samplers is 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 Ltd.

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

⁹ Review and Assessment Helpdesk Diffusion Tube Bias Adjustment Spreadsheet, Air Quality Consultants Ltd, v03/10:

http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310310.xls

certificate shown in Appendix 3). All data are ratified 6-monthly using procedures comparable to those used for national network monitoring data. Details of the automatic monitoring site in Academy Street, Forfar is shown in Appendix 4.

2.3 Nitrogen Dioxide Monitoring Results

The AQS objectives for NO₂ are summarised in Table 2.3, below.

Table 2.3	AQS objectives for NO ₂ in Scotland
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Pollutant	Air Quality Regulations and Air Quality (Scotland) Amendment Regulations
Nitrogen Dioxide	Annual mean > 40 μ g m ⁻³ to be achieved by 2005
	Hourly mean > 200 μ g m ⁻³ not to be exceeded more than
	18 times in a year to be achieved by 2005

Table 2.4 summarises the uncorrected and bias adjusted annual average NO₂ concentrations measured in Angus during 2009 using the adjustment factor described in Section 2.2.2. The associated data captures are also summarised. As can be seen, all bias adjusted concentrations are below the 2005 AQS objective of 40 μ g m⁻³ as an annual average. The highest concentration measured during 2009 was measured at Monfieth (M1) at 27.6 μ g m⁻³ with the lowest concentration measured at Ethie Ter, Arbroath (A1) at 8.5 μ g m⁻³. All raw NO₂ data are shown in Appendix 4.

The recommended data capture rate should be greater than or equal to 90% as outlined in Technical Guidance LAQM.TG(09). Two NO₂ diffusion tube sites (A2 and FOR) did not achieve this target in 2009.

Site Location	Site Code	Unadjusted 2009 (µg m⁻³)	Bias Adjusted 2009 (μg m ⁻³)	Data Capture 2009 (%)
Ethie Ter, Arbroath	A1	9.9	8.5	100
Inchape Rd, Arbroath	A2	17.4	15.0	33.3
Abbey Path, Arbroath	A3	22.1	19.0	100
22 Lordburn, Arbroath	A4	28.1	24.2	100
High St, Carnoustie	CAR	27.3	23.5	91.6
High St, Monfieth	M1	32.1	27.6	100
High St, Montrose	M2	30.3	26.1	100
High St, Brechin	B1	20.0	17.2	100
Sacone 1, Brechin	B2	10.9	9.4	100
Sacone2, Brechin	B3	10.3	8.9	100
High St, Forfar	FOR	26.2	22.5	66.7
Manse Cl, Kirriemuir	KIR	16.0	13.8	100

Table 2.4 Summary of Angus Council Annual Average NO₂ Diffusion Tube Concentrations 2009

The data capture achieved at site A2 (Inchape Road, Arbroath) was 33.3% with an average measured NO₂ concentration of 15 μ g m⁻³. The data capture achieved at site FOR (High Street, Forfar) was also below 90% at 66.7% with an average measured NO₂ concentration of 22.5 μ g m⁻³. An estimated

annual average concentration can be estimate using the method outlined in Box 3.2 of Technical Guidance LAQM.TG(09).

Two monitoring sites that form part of the national Automatic Urban and Rural Network (AURN) were chosen for this analysis:

- Aberdeen (Urban Background) located within 50 miles of Forfar and Arbroath
- Edinburgh St Leonards (Urban Background), located within 50 miles of Forfar and Arbroath

The result of this analysis is shown in Tables 2.5a and 2.5b for correcting NO₂ data from Abroath (A2) and Forfar (FOR) monitoring sites. The estimated annual mean NO₂ concentrations measured during 2009 are 10.4 μ g m⁻³ and 23.0 μ g m⁻³ at Arbroath and Forfar monitoring sites respectively.

Table 2.5a Estimation of Annual Mean NO₂ Concentrations at Inchape Road, Arbroath 2009 (µg m⁻³)

Inchape Road, Arbroath (A2)					
Long Term Monitoring Site	Annual Mean 2009 (Am)	Ratio (Am/Pm)			
Aberdeen	26	37	0.70		
Edinburgh St Leonards	24	35	0.69		
	0.69				
	10.4				

Table 2.5b Estimation of Annual Mean NO₂ Concentrations at High St, Forfar 2009 (μ g m⁻³)

High Street, Forfar (FOR)						
Long Term Monitoring Site	Annual Mean 2009 (Am)	Ratio (Am/Pm)				
Aberdeen	26	25.5	1.02			
Edinburgh St Leonards	24	23.5	1.02			
Average (R _a) 1.02						
Estimated Annual Average NO ₂ Concentration 23.0						

2.4 NO₂ Trends

Table 2.6 and Figure 2.1 summarise the bias adjusted annual average NO₂ concentrations measured at all monitoring locations during the period 2003 - 2009. Concentrations of NO₂ in 2009 decreased from 2008 levels at only three monitoring locations (M2, B1 and FOR) with the greatest drop of 9.5% measured at B1 (High St, Brechin). In comparison, an increase in NO₂ concentrations was measured at eight monitoring locations (A1, A2, A3, A4, CAR, M1, B2, and B3) with the greatest rise of 10.8% measured at CAR (High Street, Carnoustie). The annual mean NO₂ concentration measured at Manse CI, Kirriemuir remained unchanged from 2008 concentrations.

Figure 2.2 shows the annual mean NO_2 trends in Scotland during 1987 to 2009 for background concentrations and during 1997 to 2009 for kerbside and roadside concentrations. As can be seen, roadside and kerbside concentrations of NO_2 in Scotland have continued to decrease up to 2003 and are now levelling off post 2003 with a slight downward trend using 2009 provisional data. Annual mean background concentrations have also begun to level off after 2003.

When comparing this national trend to the Angus NO_2 trends it can be seen that measured annual average NO_2 concentrations at roadside and kerbside locations within Angus (A3, A4, CAR, M1, M2, B1, FOR and KIR) are showing an upward trend, which is in contrast to the national trend. Measured NO_2 concentrations at urban background and industrial locations (B2, B3, A1 and A2) agree more closely with national trends with background NO_2 concentrations remaining relatively unchanged during 2004 – 2009.

Angus Council - Scotland

Site Location	Site Code	2003 (0.81)*	2004 (0.83)*	2005 (0.73)*	2006 (0.78)*	2007 (0.91)*	2008 (0.86)*	2009 (0.77)*	% Change Between 2008 and 2009	2003 to 2009 Mean	% Change Between 2003- 2009 mean and 2009
Ethie Ter, Arbroath	A1	-	7.1	7.4	8.1	8.0	7.7	8.5	10.4	7.8	9.0
Inchape Rd, Arbroath	A2	-	8.4	8.5	9.1	10.1	9.9	10.4 ^{<i>f</i>}	5.1	9.4	10.6
Abbey Path, Arbroath	A3	16.0	13.7	13.7	15.1	17.0	17.3	19.0	9.8	16.0	19.0
22 Lordburn, Arbroath	A4	-	18.4	19.9	20.7	22.7	22.8	24.2	6.1	21.5	12.8
High St, Carnoustie	CAR	18.5	19.5	18.5	20.4	23.7	21.2	23.5	10.8	20.8	13.2
High St, Monfieth	M1	18.5	22.0	22.6	24.6	27.3	26.7	27.6	3.4	24.2	14.1
High St, Montrose	M2	16.4	19.8	19.9	22.2	25.4	27.0	26.1	-3.3	22.4	16.5
High St, Brechin	B1	12.7	13.1	14.4	15.3	17.9	19.0	17.2	-9.5	15.7	9.8
Sacone 1, Brechin	B2	-	8.5	8.9	8.3	8.5	8.7	9.4	8.0	8.7	7.8
Sacone2, Brechin	B3	-	8.9	9.1	8.4	7.3	8.4	8.9	6.0	8.5	4.7
High St, Forfar	FOR	19.1	19.5	19.4	22.9	25.6	25.3	23.0 ^f	-9.1	22.1	4.0
Manse Cl, Kirriemuir	KIR	11.3	10.4	11.4	13.0	13.4	13.8	13.8	0.0	12.4	10.9

Table 2.6 Bias Adjusted Annual Average NO₂ Concentrations from 2003 – 2009 (µg m⁻³)

*Bias adjustment factor used for correcting NO $_2$ diffusion tube data.

^f Estimated 2009 annual mean concentration



Figure 2.1 Annual Average NO₂ Concentrations Measured in Angus during 2003 – 2009 (µg m⁻³)



Figure 2.2 NO₂ Trends in Scotland¹⁰ 1986 – 2009 (Provisional)

2.5 NO₂ Monitoring - Conclusions

Using all available NO₂ monitoring data contained within this report, it has been concluded that Angus Council are not required to proceed to a Detailed Assessment for NO₂. However, it has been shown that the trend in annual mean NO₂ concentrations at Roadside and Kerbside locations is an upward trend. It is therefore recommended that current NO₂ monitoring should be maintained to allow continued assessment of NO₂ concentrations and trends in future years.

2.6 PM₁₀ Monitoring Results

The AQS objectives for PM_{10} are summarised in Table 2.7, below.

Table 2.7	AQS Objectives for PM ₁₀ in Scotland
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Pollutant	Air Quality Regulations and Air Quality (Scotland) Amendment Regulations
	Annual mean > 18 μ g m ⁻³ to be achieved by 2010
Particulate Matter (PM ₁₀)	Daily mean > 50 μ g m ⁻³ not to be exceeded more than 7
	times in a year to be achieved by 2010

Angus Council currently monitor PM_{10} at three locations throughout Angus with a Partisol and FDMS analyser collocated in Forfar (FOR2). Table 2.8 summarises the site details and data capture of the four monitoring sites. A data capture of greater than 90% was achieved at Forfar (FDMS) and Glenisla monitoring sites. Forfar (Grav) and Carnoustie monitoring sites achieved a data capture of 88.5% and 41.6% respectively and therefore the 90th percentiles of daily mean concentrations have been calculated. The 90th percentile daily mean concentrations measured at Forfar and Carnoustie were 26.3 μ g m⁻³ and 30 μ g m⁻³ respectively, which indicates that the daily mean objective was not likely to

http://www.scottishairquality.co.uk/reports.php?n_action=seminar

¹⁰ Scottish Air Quality Database Project - AQ Trends and website update - Paul Willis, AEA, March 2010:

have been breeched during 2009. No exceedences of the daily or annual mean objectives were therefore measured at any location. The highest annual mean PM_{10} concentration was measured at Carnoustie with a concentration of 18 µg m⁻³ and four days of PM_{10} daily mean concentrations of greater than 50µgm⁻³.

Site	Site Code	Classification	Data Capture (%)	Measured Concentration (μg m ⁻³)	No. Daily Exceedences	90 th Percentile Daily Mean (µg m⁻³)
Forfar (Grav)	FOR 2	Roadside	88.5	16	1	26.3
Forfar (FDMS)	FOR 2	Roadside	97.2	17	2	n/a
Carnoustie	CAR 2	Roadside	41.6	18	4	30
Glenisla	G1	Rural Background	98.9	6	0	n/a

Table 2.8	Summary of PM ₁₀ Monitoring in Angus 2009
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As a data capture of only 41.6% was achieved at the Carnoustie monitoring site it is appropriate to estimate an annual average concentration. Continuous monitoring was achieved during the period 1st January to 15th June 2009 and therefore an estimated annual average concentration can be estimate using the method outlined in Box 3.2 of Technical Guidance LAQM.TG(09).

Two monitoring sites were chosen for this analysis:

- Auchencorth Moss (Rural Background) located approximately 57 miles from Carnoustie
- Dundee Mains Loan (Urban Background), located approximately 9 miles from Carnoustie

Dundee Mains Loan forms part of the Scottish Air Quality Database (SAQD) monitoring network, run by the Scottish Government, and uses a TEOM as the PM_{10} measurement method. Auchencorth Moss forms part of the AURN and uses a TEOM FDMS as the PM_{10} measurement method. Comparable QA/QC procedures are used at both the Scottish Government and AURN monitoring networks.

The Volatile Correction Model¹¹ (Box 3.4, LAQM.TG(09)) was used in order to adjust TEOM PM₁₀ concentrations measured at Dundee Mains Loan to Gravimetric Equivalent mass concentrations. The result of this analysis is shown in Table 2.9.

Table 2.9	Estimation of Annual Mean PM ₁₀ Concentrations at Carnoustie 2009 (µg m ⁻³)
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Long Term Monitoring Site	Annual Mean 2009 (Am)	Period Mean 01/01/09 – 15/06/09 (Pm)	Ratio (Am/Pm)
Auchencorth Moss	7	7	1.00
Dundee Mains Loan	13	14	0.93
	0.97		
	17 μ g m - ³		

In order to assess the likely number of daily means of greater than 50 μ g m⁻³ at Carnoustie during 2009, the following equation from LAQM.TG(09) can been used:

$$y = -18.5 + 0.00145x^3 + \frac{206}{x}$$

Where y is the number of 24-hour exceedences of 50 μ g m⁻³ and x is the annual mean gravimetric PM₁₀ concentration, which has been calculated as 17 μ g m⁻³.

Using the above equation it is estimated that there was one exceedence of the daily mean objective during 2009. However, four daily exceedences were measured during the period 1st January to 15th

http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube290909.xls

¹¹ Review and Assessment Helpdesk Diffusion Tube Bias Adjustment Spreadsheet, Air Quality Consultants Ltd, v09/09:

June 2009. Therefore, a minimum of 4 daily exceedences are estimated to have occurred at Carnoustie during 2009.

Figures 2.3 to 2.6 show time-series plots of PM_{10} concentrations at all monitoring sites during 2009. As can be seen, elevated PM_{10} concentrations were measure at all monitoring sites during February to April 2009. All daily exceedences measured at all monitoring sites were recorded during this period.







Figure 2.5 Carnoustie Daily Average PM₁₀ Concentrations 2009 – CAR1





2.7 PM₁₀ Pollution Episodes 2009

In order to assess whether exceedences of the AQS daily objective for PM_{10} are due to local emissions it is appropriate to investigate whether nation-wide pollution episodes occurred. If elevated PM_{10} concentrations have been caused by emissions outwith the Local Authorities control it can be concluded that no strategies can be put into place to control these emissions.

There were two recorded PM₁₀ episodes during 2009:

- Long range transport of particulates from mainland Europe¹², 18th to 22nd March 2009 (report shown in Appendix 5)
- Sahara Dust and Smoke from mainland Europe¹³, 15th 20th April 2009

Figures 2.7 and 2.8 show time-series plots of hourly average PM_{10} concentrations during March and April respectively at the following monitoring sites located throughout Scotland:

- Aberdeen (AURN)
- Angus Forfar (SAQD)
- Auchencorth Moss (AURN)
- Edinburgh St Leonards (AURN)
- Glasgow Centre (AURN)
- Glasgow Kerbside (AURN)



Figure 2.7 PM₁₀ Pollution Episode during March 2009

¹² Widespread Increase in Particulate concentrations March 17 – 21st 2009, AEA, 20th April 2009:

 $http://www.scottishairquality.co.uk/documents/news/Report_on_Widespread_Increase_in_Particulate_concentrations_in_Scotland_March_17_to_21st_2009.pdf$

¹³ Scottish Air Quality Database Project - AQ Trends and website update - Paul Willis, AEA, March 2010:

http://www.scottishairquality.co.uk/reports.php?n_action=seminar



Figure 2.8 PM₁₀ Pollution Episode during April 2009

As can be clearly seen, elevated concentrations of PM_{10} were measured at all sites between 17^{th} and 21^{st} March and between 14^{th} and 25^{th} April.

Table 2.10 summarises the dates where the daily mean objective was exceeded at Forfar and Carnoustie monitoring sites during 2009. When comparing the periods when the daily mean objective was exceeded and the periods when the PM_{10} pollution episodes occurred it can be seen that the majority of the exceedences occurred during the pollution episode. Therefore, these exceedences were, at least in part, a result of emissions outwith Angus Councils' control. Two exceedences of the daily mean objective were measured on 30th and 31st January 2009 at Carnoustie, which are more likely to have occurred as a result of local emissions.

Table 2.10	Estimation of Annual Mean PM ₁₀ Concentrations at Carnoustie 2009 (µgm ⁻³)	ļ
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Site	No of Daily Exceedences	Days where Daily Objective was Breeched
Forfer (EDMS)	1	20/03/2009
Fortar (FDIVIS)	1	25/04/2009
Forfar (Grav)	1	20/03/2009
Corpountio	2	30 - 31/01/2009
Carnoustie	2	24 - 25/04/2009

2.8 PM₁₀ 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_{10} concentrations measured by the TEOM analyser during each period of monitoring between 2000 and 2006 are summarised in Table 2.11 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(09) and the concentrations measured by the FDMS analyser are highlighted in bold. It can be seen that measured annual average PM_{10} concentrations measured using the TEOM decreased significantly in 2003/4 from 2002 levels where the measured concentrations dropped to 15 μ g m⁻³ from 27 μ g m⁻³. Annual average PM_{10} concentrations relatively stable between 2006 and 2009, with an increase from 16 μ g m⁻³ to 17 μ g m⁻³ between 2008 and 2009.

Monitoring Period	Period Mean Concentration (μg m ⁻³)	Estimated Annual-Mean Concentration (μ g m ⁻³)
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
Jul 2007 – Dec 2007 (FDMS)	15	16
Jan – Dec 2008 (FDMS)	16	-
Jan – Dec 2009 (FDMS)	17	-

Table 2.11	PM ₁₀ Concentrations Measured by the TEOM and FDMS Analysers between 2000 and 2009
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As discussed in Section 2.1, gravimetric PM_{10} 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 2009 are summarised in Table 2.12 and graphed in Figure 2.9. 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 2.9 that PM_{10} 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_{10} concentrations have levelled out during 2005 to 2009. The Glenisla monitoring site is classified as rural background and therefore PM_{10} concentrations measured at that location are not expected to fluctuate greatly, which agrees with the monitoring.

Figure 2.10 shows the national PM_{10} trend between 1992 to 2009 at background locations and 1997 to 2009 at kerbside and roadside locations. Background concentrations have continued to decrease between 1992 and 2009 with concentrations now levelling off at approximately 15 µg m⁻³. This agrees with the PM_{10} trend in Angus where PM_{10} annual mean concentrations have remained relatively unchanged, but at a lower concentration of 6 µg m⁻³ (at Glenisla). When comparing PM_{10} trends at kerbside and roadside locations in Angus to the national trend it can be seen that the national trend shows that annual mean concentrations in 2009 are not much lower that 2001 concentrations. Annual mean concentrations at Forfar and Carnoustie (roadside locations) agree with the national trend with PM_{10} concentrations levelling out during 2005 to 2009.

Site Location	Site Code	2003	2004	2005	2006	2007	2008	2009	% Change Between 2008 and 2009	2003 – 2009 Mean	% Change Between 2003- 2009 and 2009
Chapel Park Primary School, Forfar	FOR2	33	27	16	17	19	17	16	-5.9	20.7	-29.5
Dundee Street, Carnoustie	CAR2	-	12	15	18	16	14	17*	21.4	15.3	9.8
Glenisla Primary School, Glenisla	G1	-	-	5	7	7	6	6	0.0	6.2	-3.3

Table 2.12 Gravimetric PM₁₀ Monitoring 2003 – 2009 (µg m⁻³)

* Estimated 2009 annual mean concentration



Figure 2.9 Annual Average PM₁₀ Concentrations Measured in Angus during 2003 – 2009 (µg m⁻³)



Figure 2.10 PM₁₀ Trends in Scotland¹⁴ 1991 – 2009 (Provisional)

2.9 **PM**₁₀ Monitoring - Conclusions

Therefore, using all available PM_{10} data contained within this report, it has been shown that measured PM_{10} concentrations at all monitoring sites did not exceed the annual mean objectives in 2009. Annual mean PM_{10} concentrations of 16 µg m⁻³ and 17 µg m⁻³ were measured by the Partisol sampler (FOR2 (Grav)) and FDMS analyser (FOR2 (FDMS))) respectively, both of which are located at Chaplepark Primary School, Forfar. Annual mean concentrations of 17 µg m⁻³ and 6 µg m⁻³ were measured at Dundee Street, Carnoustie (CAR2) and Glenisla Primary School, Glenisla (G1) respectively. The daily mean objective was also met with only 1 exceedence of 50 µg m⁻³ being measured at FOR2 (Grav) and 2 exceedences being measured at FOR2 (FDMS). Four exceedences of the daily objective were measured at Dundee Street, Carnoustie and no exceedences at Glenisla Primary School, Glenisla. However, a number of these daily exceedences could be attributed, in part, to two pollution episodes that occurred in March and April 2009 and caused by long range transport of particulates from mainland Europe and the Sahara.

Trend analysis of annual mean PM_{10} concentrations at Forfar, Carnoustie and Glenisla shows that concentrations have remained stable since 2005 with no upward or downward trend, which agrees with the national trend where PM_{10} concentrations are beginning to level out.

It is therefore concluded that Angus Council is not required to proceed to a Detailed Assessment for PM_{10} but that they should maintain their current monitoring programme.

http://www.scottishairquality.co.uk/reports.php?n_action=seminar

¹⁴ Scottish Air Quality Database Project - AQ Trends and website update - Paul Willis:

3 New Local Developments

3.1 Road Traffic Sources

Angus Council confirms that there are no new/newly identified road traffic sources which are likely to have an adverse impact on air quality.

3.2 Other Transport Sources

Angus Council confirms that there are no new/newly identified transport sources which are likely to have an adverse impact on air quality.

3.3 Industrial Sources

Current industrial emissions within the Angus Council area predicted to have an insignificant impact on air quality and the current monitoring network maintained by Angus Council will be sufficient to identify any changes in NO_2 and PM_{10} concentrations. It is also recommended that it is not necessary for Angus Council to initiate monitoring of any additional AQS pollutants. A list of Part A and Part B regulated industrial processes in Angus are listed in Appendix 6.

Angus Council confirms that there are no new/newly identified industrial installations which are likely to have an adverse impact on air quality.

3.4 Commercial and Domestic Sources

A list of new developments within Angus that may have an impact on air quality is given in Table 3.1 below. Only one development, located in Barry, Carnoustie, has been assessed to require an impact assessment to investigate the possible air quality impact for PM_{10} of 4 new houses located 50m from Cotside sand and gravel quarry. The remaining developments require either no impact assessment or only odour impact assessments.

Reference Number	Address	Description	Decision	Impact Assessment
10/00191/ful	Lundie Castle, Muirhead	Poultry unit for 32,000 birds	Pending	Odour
09/00695/out	Shank of Omachie, Wellbank	160 houses 300m from quarry	Pending	No (houses moved further away)
09/01298/full	Bractullo Farm, Letham	Poultry unit for 23,000 birds	Granted	Odour
09/01035/ful	Crookit Rigs, Barry, Carnoustie	4 houses 50m from Cotside sand and gravel quarry	Pending	Particulates

Table 3.1	Biomass Boilers within the Angus Council Boundary
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Angus Council has identified the above new commercial developments which may have an impact on air quality (whether by changing traffic flows or otherwise). However, a Detailed Assessment is not required at this stage.

3.5 New Biomass Boilers

There are currently 8 biomass installations located within the Angus Council boundary with one further installation planned to be operational from June 2010 at Peel Farm Primary School. A list of the biomass installations are summarised in Table 3.2. The majority of the biomass units are operated by Angus Council and are located at primary schools throughout Angus. Two installations are privately operated; one located at Millgate Loan, Abroath providing power to a residential home and one located at St Ninian's Road, Padanaram providing power to 20 houses. One new installation is now operational since the 2009 USA and is a privately owned 300kW boiler installed with a multicyclone and located at Kinnaird Castle, Brechin.

Biomass Unit	Grid Ref	Operator	Boiler Details	Maximum Output (kW)	Start Date
Tannadice Primary School by Brechin, DD8 3SH	347530, 758176	Angus Council	Binder rrk200-350 Woodchip with Glosfume ceramic filters	300	Oct 2007
Ladyloan Primary School,Arbroath, DD11 1LX	363912, 740580	Angus Council	Binder rrk130-250 Woodchip with Glosfume ceramic filters	250	Aug 2008
Airlie Primary School, DD8 5NP	331634, 750153	Angus Council	Froling Turbomatic 110 Woodchip with Glosfume ceramic filters	110	Feb 2009
Seaview Primary School Monifieth, DD5 4HL	349423, 732559	Angus Council	Binder rrk200-350 Woodchip Glosfume ceramic filters	250	Aug 2009
Millgate Loan, Arbroath, DD11 1QG	363758,740455	Private - large residential home	Biotech PZ100RL Pellet	100	Apr 2009
Glen Doll Ranger Station, DD8 4RD	328138,776182	Angus Council	-	15	Mar 2008
Peel Farm Primary School, DD8 5JJ	327295,754091	Angus Council	-	45	Jun 2010
St Ninians Road, Padanaram	342709,751444	Private - 20 houses	-	-	Jan 2009
Kinnaird Castle, Brechin	NO 63484 57183	Private	REKA HKRST 300 Multicyclone Woodchip	300	2010

Table 3.2 Biomass Boilers within the Angus Council Boundary

As outlined in LAQM.TG(09) it is only necessary to assess the possible impacts of individual biomass installations with maximum power outputs of between 50kW and 20MW. The following assessment has been carried out for the Kinnaird Castle installation, and uses the methodology outlined in Box 5.8, LAQM.TG(09). The remaining biomass installations were assessed in the 2009 Uodating and Screening Assessment, which conclude that a Detailed Assessment was not required.

Tables 3.3 to 3.5 summarise the assessment of whether relevant biomass installations within Angus are likely to result in exceedences of the following AQS objectives at these locations:

- PM₁₀ annual mean objective (Table 3.3)
- NO₂ annual mean objective (Table 3.4)

NO₂ hourly mean objective (Table 3.5)

The emission rates quoted for Kinnaird Castle have been taken from Table A2.20 in LAQM.TG(09) as no emissions data were available from the boiler manufacturer.

The background NO_2 and PM_{10} concentrations were taken from the 2009 UK background maps¹⁵ provided on the national air quality website:

http://www.airquality.co.uk/laqm/tools.php?tool=background06

In order to calculate the threshold emission rates for each installation, the following information was used:

- Height of the highest building within 5 stack heights of the stack
- The stack diameter
- Stack height
- Effective stack height
- Background PM₁₀ and NO₂ concentrations at each installation

These data were inputted into the biomass calculator¹⁶ available to download from:

http://www.airquality.co.uk/laqm/tools/biomass_calculator_tool6.xls

This spreadsheet uses the calculations set out in Box 5.8, LAQM.TG(09) and the Scotland nomograms derived in the report:

*Measurement and Modelling of Fine Particulate Emissions (PM10 & PM2.5) from Wood-Burning Biomass Boiler*¹⁷, available from http://www.scotland.gov.uk/Publications/2008/11/05160512/0

If it is identified that the emission rate of a biomass installation is greater than the calculated threshold emission rate, a detailed assessment of the possible impacts of that installation will be required.

Annual Mean PM₁₀ Objective

The assessment has shown that it is unlikely that the PM_{10} Annual mean objective will be exceeded at the Kinnaird Castle biomass installation. It is therefore concluded that Angus Council are not required to proceed to a Detailed Assessment for PM_{10} at any of these locations.

	Annual Mean PM ₁₀										
Biomass Unit	Building Height (m)	Stack Diameter (m)	Stack Height (m)	Effective Stack Height (m)	Background Concentration (µg m ⁻³)	Emission Rate (g/s)	Target Emission Rate (g/s)	Detailed Assessment Required?			
Kinnaird Castle, Brechin	7	0.25	10.5	5.8	10.2	0.035	0.05	NO			

Table 3.3 Assessments of Individual Biomass Installations – Annual Mean PM_{10}

¹⁵ Maps of UK background concentrations for NO_x, NO₂, PM₁₀:

http://www.airquality.co.uk/laqm/tools.php?tool=background06

¹⁶ Biomass Calculator v6:

http://www.airquality.co.uk/laqm/tools/biomass_calculator_tool6.xls

¹⁷ Measurement and Modelling of Fine Particulate Emissions (PM10 & PM2.5) from Wood-Burning Biomass Boilers, AEA, 26th September 2008

Annual Mean NO₂ Objective

The assessment has shown that it is unlikely that the NO_2 annual mean objective will be exceeded at the Kinnaird Castle biomass installation. It is therefore concluded that Angus Council are not required to proceed to a Detailed Assessment for NO_2 at any of these locations.

	Annual Mean NO ₂										
Biomass Unit	Building Height (m)	Stack Diameter (m)	Stack Height (m)	Effective Stack Height (m)	Background Concentration (μg m ⁻³)	Emission Rate (g/s)	Target Emission Rate (g/s)	Detailed Assessment Required?			
Kinnaird Castle, Brechin	7	0.25	10.5	5.8	4.1	0.075	0.23	NO			

Hourly Mean NO₂ Objective

The assessment has shown that it is unlikely that the NO_2 hourly mean objective will be exceeded at the Kinnaird Castle biomass installation. It is therefore concluded that Angus Council are not required to proceed to a Detailed Assessment for NO_2 at any of these locations.

Table 3.5 Assessment of Individual Biomass Installations – NO ₂ Hourly Me	ean
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Hourly Mean NO ₂										
Biomass Unit	Building Height (m)	Stack Diameter (m)	Stack Height (m)	Effective Stack Height (m)	Background Concentration (µg m ⁻³)	Emission Rate (g/s)	Target Emission Rate (g/s)	Detailed Assessment Required?		
Kinnaird Castle, Brechin	7	0.25	10.5	5.8	4.1	0.075	0.266	NO		

Angus Council has identified one new biomass boiler. However, a Detailed Assessment is not required at this stage.

3.5.1 Biomass Combustion Combined Impacts

Investigation into biomass combustion has lead to a concern that although single installations may not have a detrimental impact on PM_{10} concentrations, the combined affect of many installations within a small area may lead to unacceptably high levels of PM_{10} .

Within Angus the use of individual domestic biomass appliances is thought to be very small and sporadic with no large conglomeration of units. It is therefore concluded that the highest density of usage relates to the service sector/private sector biomass boilers already identified in the 2009 Updating and Screening Assessment. Two of these appliances, Ladyloan Primary School and Millgate Loan, Arbroath, are located within approximately 300m of each other and therefore it is recommended that the combined impacts of these boilers is assessed. The methodology outlined in Box 5.9, LAQM.TG(09) has been used in conjunction with the Scotland nomograms from the biomass report discussed in Section 3.2 to carry out this assessment. Abroath has been defined as a small town for this assessment.

Table 3.6 details the size (hectares) and emissions (per hectare) of the biomass installations with the modelled annual average background PM_{10} concentration and threshold emission. The emissions quoted for both boilers have been taken from Table 5.3 in LAQM.TG(09). The boiler located at Ladyloan Primary School is wood burning and uses ceramic filters. Therefore the fabric filter emission figure of 31 kg/year/hectare has been used. The boiler located at Millgate Loan also uses wood fuel but does not incorporate a filter. Therefore, the emission figure of 1074 kg/year/hectare has been used.

Table 3.7 again details the boiler size and emissions, however, it is assumed that there is no ceramic filter installed at Ladyloan Primary school. In this case both boilers are assumed to have emissions of 1074 kg/year/hectare. As can be seen, the combined emissions from both the boilers are below the threshold emission limit of 4900 kg/year/hectare with or without considering the ceramic filter at Ladyloan Primary School. It is therefore concluded that Angus Council is not required to proceed to Detailed Assessment.

Annual Mean Objective PM ₁₀ – Incorporating Ceramic Filter										
Biomass Unit	Floor Area (hectares)	Plot Area (hectares)	Emissions (kg/year/hectare)	Background Concentration (μg m ⁻³)	Calculated Combined Emissions (kg/year/hectare)	Threshold Emission Density (kg/year/hectare)	Detailed Assessment Required?			
Ladyloan Primary School,Arbroath, DD11 1LX	0.3	0.7	31	9.9	1929	4900	NO			
Millgate Loan, Arbroath, DD11 1QG	0.25	2.9	1074							

Table 3.6 Assessment of the Combined Impacts of	of Biomass Installations – with Ceramic Filter
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Table 3.7 Assessment of the Combined Impacts of Biomass Installations – without Ceramic Filter

Annual Mean Objective PM ₁₀ – Without Ceramic Filter								
Biomass Unit	Floor Area (hectares)	Plot Area (hectares)	Emissions (kg/year/hectare)	Background Concentration (µg m⁻³)	Calculated Combined Emissions (kg/year/hectare)	Threshold Emission Density (kg/year/hectare)	Detailed Assessment Required?	
Ladyloan Primary School,Arbroath, DD11 1LX	0.3	0.7	1074	9.9	4102	4900	NO	
Millgate Loan, Arbroath, DD11 1QG	0.25	2.9	1074					

Angus Council has assessed the combined impact of biomass combustion and concluded that a Detailed Assessment is not required at this stage.

3.6 New Developments with Fugitive or Uncontrolled Sources

Angus Council confirms that there are no new fugitive or uncontrolled source which may have an impact on air quality within the Local Authority area.

4 Conclusions and Proposed Actions

4.1 Conclusions from New Monitoring Data

Angus Council currently maintains an air quality monitoring network monitoring nitrogen dioxide (NO₂) using diffusion tubes at 11 locations throughout Angus and PM_{10} particulate matter using at three sites. PM_{10} 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.

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 2009 Updating and Screening Assessment, which concluded that no Air Quality Strategy (AQS) Objectives for these pollutants were likely to be exceeded. There are also no existing or planned developments that could result in any exceedences of the AQS objectives for the abovementioned pollutants.

Analysis of NO_2 data for 2009, 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 for NO_2 .

Trend analysis of NO₂ data indicates that the underlying trend at all Roadside and Kerbside monitoring locations in Angus is an increase in NO₂ annual mean concentrations between 2003 and 2009 with concentrations remaining relatively unchanged at Urban Background and Industrial monitoring sites.

Annual mean PM_{10} concentrations of 16 µg m⁻³ and 17 µg m⁻³ were measured by the Partisol sampler (FOR2 (Grav)) and FDMS analyser (FOR2 (FDMS)) respectively, both of which are located at Chaplepark Primary School, Forfar. Annual mean concentrations of 17 µg m⁻³ and 6 µg m⁻³ were measured at Dundee Street, Carnoustie (CAR2) and Glenisla Primary School, Glenisla (G1) respectively. The daily mean objective was also met with only 1 exceedence of 50 µg m⁻³ being measured at FOR2 (Grav) and 2 exceedences being measured at FOR2 (FDMS). Four exceedences of the daily objective were measured at Dundee Street, Carnoustie and no exceedences at Glenisla Primary School, Glenisla. However, a number of these daily exceedences could be attributed, in part, to two pollution episodes that occurred in March and April 2009 and caused by long range transport of particulates from mainland Europe and the Sahara.

Trend analysis of annual mean PM_{10} concentrations at Forfar, Carnoustie and Glenisla shows that concentrations have remained stable since 2005 with no upward or downward trend, which agrees with the national trend where PM_{10} concentrations are beginning to level out.

The review of new monitoring data available for 2009 and contained within this report confirms the conclusions of the 2009 USA Report for NO_2 and PM_{10} that Angus Council is not required to proceed to a Detailed Assessment.

4.1 Conclusions relating to New Local Developments

The review of potential sources contained within this report confirms that it is unlikely that the AQS objectives for any pollutant will be exceeded due to the following sources:

- Road Traffic
- Other transport Sources
- Industrial Sources
- Fugitive and Uncontrolled Sources
- Commercial and Domestic Sources
- New Biomass Boilers

A review of transport sources has identified that there are no new or existing transport sources that are likely to lead to an exceedence of the AQS objectives for any pollutant.

A review of regulated industrial processes has identified that there are no new or existing industrial processes that are likely to lead to an exceedence of the AQS objectives for any pollutant.

A review of fugitive and uncontrolled sources has shown that there are no new sources that are likely to lead to an exceedence of the AQS objectives for PM_{10} .

A review of new commercial, residential and public developments within Angus has shown that it is unlikely that an exceedence of the AQS objectives for any pollutant as a result of these developments.

An assessment of biomass installations within Angus has shown that Angus Council are not required to proceed to a Detailed Assessment for any of the installations. In addition, a screening assessment of the combined impacts of two biomass boilers located at Ladyloan Primary School and Millgate Loan, Arbroath, has shown that it is unlikely to lead to an exceedence of the AQS objectives for any pollutant.

It is therefore concluded that Angus Council are not required to proceed to a Detailed Assessment as a result of any new developments.

4.2 Proposed Actions

- 1. The current monitoring programme should be maintained in order to continue to assess NO_2 and PM_{10} concentrations within Angus.
- 2. Angus Council should submit an Air Quality Progress Report in 2011.

5 References

LAQM Updating and Screening Assessment 2006, BMT Cordah Ltd, E_AGC_005/2003, April 2003

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LAQM Progress Report 2005, BMT Cordah Ltd, E_AGC_009/2005, 16th May 2005

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Local Air Quality Management Detailed Assessment 2007, BMT Cordah Ltd, E_AGC_011/Report 2, 4th October 2007

Air Quality Review and Assessment Progress Report 2007/8: Angus Council, AEA, AEAT/ENV/R/2725/Issue 2, 2nd February 2009

2009 Air Quality Updating and Screening Assessment for Angus Council, AEA, AEAT/ENV/R/2904, 2nd November 2009

Part IV of the Environment Act 1995, Local Air Quality Management, Technical Guidance LAQM.TG(09) February 2009

Review and Assessment Helpdesk Diffusion Tube Bias Adjustment Spreadsheet, Air Quality Consultants Ltd, v03/10:

http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310310.xls

Widespread Increase in Particulate concentrations March 17 – 21st 2009, AEA, 20th April 2009:

http://www.scottishairquality.co.uk/documents/news/Report_on_Widespread_Increase_in_Particulate_ concentrations_in_Scotland_March_17_to_21st_2009.pdf

Scottish Air Quality Database Project - AQ Trends and website update - Paul Willis, AEA, March 2010:

http://www.scottishairquality.co.uk/reports.php?n_action=seminar

Volatile Correction Model, ERG King's College London, last modified 28th April 2009:

http://www.volatile-correction-model.info/

Maps of UK background concentrations for NO_x, NO₂, PM₁₀:

http://www.airquality.co.uk/laqm/tools.php?tool=background06

Biomass Calculator v6:

http://www.airquality.co.uk/laqm/tools/biomass_calculator_tool6.xls

Measurement and Modelling of Fine Particulate Emissions (PM10 & PM2.5) from Wood-Burning Biomass Boilers, AEA, 26^{th} September 2008

Appendices

Appendix 1: NO₂ Diffusion Tube Monitoring Site Locations

Appendix 2: PM₁₀ Monitoring Site Locations

Appendix 3: UKAS Audit Certificate - Forfar Automatic PM₁₀ Monitoring Site

Appendix 4: Automatic PM₁₀ Monitoring Site – Forfar

Appendix 5: Widespread Increase in Particulate concentrations March $17 - 21^{st} 2009$

Appendix 6: Regulated Industrial Processes in Angus

Appendix 1: NO₂ Diffusion Tube Monitoring Site Locations



Legend

Δ

NO₂ 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, Monfieth
M2. High St, Montrose
B1. High St, Brechin
FOR. High St, Forfar
KIR. Manse CI, Kirriemuir
B2. Sacone 1, Brechin
B3. Sacone 2, Brechin

Appendix 2: PM₁₀ Monitoring Site Locations



Appendix 3: UKAS Audit Certificate – Forfar Automatic Monitoring Site



CERTIFICATE OF CALIBRATION

Glengarnock Technology Centre, Caledonian Road, Lochshore Business Park, Glengarnock, Ayrshire, KA14 3DD. Telephone 0870 1905269 Fax 0870 1905151



Approved Signatories:	K. Stevenson	S. Stratton
Signed: Stalk	Date: 22 nd March 2010	
Date of issue: Cert No: 2255		22 nd March 2010 Page 1 of 2
Customer Name and Address:	Scottish Government Water, Air, Soils and Flooding Division Environmental Quality Directorate Scottish Government Victoria Quay Edinburgh EH6 6QQ	
Description:	Calibration factors for Angus Council's station.	Forfar air monitoring
AEA Identification Number:	43060/ANGUS/A1A2	

Site / Date Test Carried Out	Species	Analyser Serial No.	Parameter	Specified Value	Measured Value	Deviation %
			Main Flow ⁴	3.00	2.98	-0.8
Forfar	FDMS	06560	AuxFlow ⁴	13.66		
19 Jun 2009	PM ₁₀	20009	Total Flow ⁴	16.67	16.11	-3.4
			k0 ⁵	14313	14161	-1.1
			Main Flow ⁴	3.01	3.01	0.3
Forfar	FDMS	26560	AuxFlow ⁴	13.66		
21 Dec 2009	PM ₁₀	20069	Total Flow ⁴	16.67	15.96	-4.3
			k_0^{5}	14313	14126	-1.3

Uncertainties:

FDMS PM ₁₀	Main Flow	±2.2%
	Total Flow	±2.2%
	Aux Flow	±2.2%
	k _o	$\pm 1.0\%$

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95% The uncertainty evaluation has been carried out in accordance with UKAS requirements. This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards Laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory

Date of issue: Cert No: 2255 AEA Identification Number:

22nd March 2010 Page 2 of 2

43060/ANGUS/A2

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NO_x analysers only) by documented methods. The factors have been calculated using certified gas standards. The particulate analysers listed above have been tested for sample flow rates and k_0 (where appropriate) by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified. All results for gaseous species are given in ppb (parts per billion) mole fractions or ppm (parts per million) mole fractions.

¹The zero response is the zero reading on the data logging system of the analyser when audit zero gas was introduced to the analysers under test.

²The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (ppb for NO, NO_x, SO₂, O₃ and ppm for CO. Where 1 ppm = 1000 ppb). It should be used in conjunction with the zero response. A corrected concentration is calculated using the following equation:

Concentration = F (Output - Zero Response)

Where F = Calibration Factor provided on this certificate Output = Reading on the data logging system of the analyser Zero Response = Zero Response provided on this certificate

³Converter eff. is the measured efficiency of the NO₂ to NO converter within the oxides of nitrogen analyser under test.

⁴The measured main flow rate (where applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured aux flow rate (where applicable) is the flow rate through the bypass tubing of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are l.min⁻¹. Where flow rates are highlighted in bold, it indicates that measurements were not made at the analyser sample inlet. These measurements therefore may not accurately reflect analyser performance in normal operation.

FDMS analyser flow rate measurements are consistent with the TEOM's stated above.

⁵The calculated k_0 value (TEOM analysers only) is the calculated k_0 spring constant based on tests undertaken with filters of known weight. The % deviation indicates the closeness of the calculated result to the manufacturer's specified k_0 value.

The calibration results shaded are those that fall within our scope of accreditation, all other results on this certificate are not UKAS accredited, but have been included for completeness.

Appendix 4: Raw Monthly Average NO₂ Diffusion Tube Data 2009

	A1	A2	A3	A 4	B1	B2	B3	CAR	FOR	KIR	M1	M2
Jan-09	19.7	23.6	34	40.3	25.4	20.6	18.6	41		23	43.6	42.8
Feb-09	14.3	16.7	32.2	39.8	25.7	14.3	13.5	37.6	39.1	21.8	45.9	45.7
Mar-09	11.0		21.4	32.5	16.8	10.3	9.2	31.9	29.4	16.4	38.3	27.3
Apr-09	9.8		17.1	24.3	20.2	11	10.5	22.7	32.2	16.1	23.4	29.1
May-09	7.0		20	21.7	18.7	7.5	7.8	21.5	23.7	13.3	28.3	25
Jun-09	5.9		14.4	17.9	13.3	6.1	5.3	19.6	23.5	8.7	15.2	20.4
Jul-09	5.5		16.3	20.3	15.7	5.3	6.4	22	13.5	9.2	23.3	21.9
Aug-09	6.0		18.6	21.4	11.5	6.3	5.8	19.9		10.8	23.3	22.9
Sep-09	6.9		19.8	24.1	15.8	8.2	6.5	25.9		13.7	29.6	24.8
Oct-09	10.9		25.6	31	22.3	12.7	12.3	27.8	20.9	16.8	30.4	28.6
Nov-09	10.0	15.7	24	31.7	23.2	13.6	11.9	30.8	27.3	20.5	38.8	36.5
Dec-09	11.5	13.6	22.1	32.5	31	14.4	16.1			22	45.6	38.5
Annual Mean:	9.9	17.4	22.1	28.1	20.0	10.9	10.3	27.3	26.2	16.0	32.1	30.3
Data Capture (%):	100	33.3	100	100	100	100	100	91.6	66.7	100	100	100

Table A4.1 Raw Monthly Average NO₂ Concentrations 2009

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

Appendix 5: Automatic PM₁₀ Monitoring Site -Forfar



Station Name:	Angus Forfar (FOR2)
Site Owner/operator:	Angus Council
Easting:	345914
Northing:	750613
Altitude:	66m
Site Classification:	Roadside
Distance to kerb and road name/number	5m – Academy St (A932)
Start date of monitoring	12 th July 2007
Network affiliation:	None
Quality control procedures:	6-monthly QA/QC audit and monthly site visits
Pollutants measured on site:	PM ₁₀ (FDMS)
Instrument manufacturer:	TEOM FDMS – R and P
Site service arrangements:	Yearly service by Air Monitors

Appendix 6: Widespread Increase in Particulate concentrations March 17 – 21st 2009

During the recent spell of warm weather many of you will have noticed that visibility was fairly poor with a distinct haze being observed across both urban and rural areas of Scotland.

Our analysis of measurements from the Scottish Air Quality Database has shown that this coincided with a large increase in measured PM₁₀ and PM_{2.5} concentrations, as illustrated in the graphs below.



March 2009

Over half of the PM₁₀ monitoring sites in the Scottish Air Quality Database database recorded an exceedence of the 50 μ g m³ daily mean objective during this period. Ten monitoring stations recorded 3 or 4 days with exceedences, which will be significant for those local authorities close to exceeding the PM₁₀ daily mean objective. Source apportionment for this episode is therefore very important for Local Air Quality Management purposes.

A large proportion of the PM₁₀ particulates (18-20 μ g m³) were measured as being in the volatile fraction – a clear indication that they were most likely to be particulate nitrate from long-range transport of pollution. Sure enough our analysis of the air sources - as illustrated below - shows that the air reaching Scotland was circulating round from Northern Europe and southern England, probably bringing this particulate pollution with it.

This incident was widespread across the UK, not only affecting Scotland, but most parts of England and Wales as well.

96-hour Air Mass back-trajectory plot

Airmass back trajectories for 96 hours upto 12:00 Friday 20-03-2009

Appendix 7: Regulated Industrial Processes in Angus

A list of regulated industrial processes (Part A or B) for atmospheric pollutants is presented in Table A6.1. Table A6.2 lists all IPPC (Integrated Pollution Prevention and Control) regulated industrial processes within the Angus Council area.

Reference	Company	NGR	Brief description	PPC Sec. No.	Part A or B
PPC/E/20044	Sacone Environmental Ltd, Animal Carcass Incinerator, Montrose Rd, Brechin, DD9 7PL	NO 6133 5946	Waste Management- Incineration of haz waste (animal carcasses) in co- ncineration plant	5.1.b	Part A
PPC/E/20068	2 Sisters (prev Joseph Mitchell (Letham) Ltd), 2 Woodside Road, Letham, Forfar, DD8 2QD	NO 52531 48210	OTHER ACTIVITIES- Animal (chicken) Slaughterhouse	6.8.c	Part A
PPC/E/20073	Macarron Electroplaters, Orchardbank Ind Est, Forfar, DD8 1UQ	NO44284 50183	METALS- Surface treatment of metals	2.3	Part A
PPC/E/20075	Forfar Galvanisers Ltd, Carseview Road, Forfar, Angus, DD8 3EE	NO 45934 51527	METALS- Surface treatment of metals	2.3	Part A
PPC/E/20078	A P Jess (Brechin) Ltd, Brechin Abattoir, Montrose Rd, Brechin, DD9 7PL	NO 61349 59549	OTHER ACTIVITIES- Animal Slaughterhouse	6.8.c	Part A
PPC/E/30052	Ennstone Thistle, Ethiebeaton Quarry	NO 48743 33967	Cement Batching , Roadstone Coating, Crushing	3.1.a.(ii), 3.5.c, 3.5.e	Part B
PPC/E/30055	Paragon (previously Car Transporter Services Northern Ltd & Richard Lawson Autologistics Ltd), Hillhead, Northmuir, Kirriemuir DD8 4PB	NO 3805 5477	Vehicle resprayer	6.4.b	Part B
PPC/E/30056	D Geddes, Ardownie Quarry	NO 49380 33689	Cement Batching, Crushing	3.1.a.(ii) + 3.5.a	Part B
PPC/E/30057	Tayside Accident Repair, Elliot Industrial Estate, Arbroath, Angus, DD11 2NJ	NO 62395 40144	Vehicle resprayer	6.4.b	Part B
PPC/E/30058	Gemini Corrosion, Brent Avenue, Forties Road Industrial Estate, Montrose, Angus, DD10 9PB	NO 71587 60328	Spray > 5t organic solvents	6.4.c.(iii)	Part B
PPC/E/30059	D Geddes Waulkmill Quarry Roadstone Coating Plant, By Inverkeilor, DD11 4UT	NO 63175 49280	Roadstone Coating	3.5.e	Part B
PPC/E/30060	Rosehill Timber, Clearymoor Sawmill, Rosehill, Northwaterbridge, Aberdeenshire, AB30 IQD	NO 63399 67692	Timber activities	6.6.(i)	Part B
PPC/E/30087	Aggregate Industries, Arnhall Quarry, By Edzell DD9 7UZ	NO 60925 69494	Cement Batching	3.1.a.(ii)	Part B
PPC/E/30089	Tayblast Services Ltd, Lunan Bay Corrosion Centre, Lunan Bay, By Montrose, Angus	NO 68600 53057	Spray > 5t organic solvents	6.4.c.(iii)	Part B
PPC/B/1000001	Laird Bros (Forfar) Ltd, Forfar, Whitehill Brickworks, Forfar	NO 46937 51565	Cement Batching	3.1 a(ii)	Part B
PPC/B/1000021	Dick Precast Ltd, Taymouth Engineering Works, Anderson St Carnoustie DD7 7LZ	NO 55117 34097	Cement Batching	3.1.a.(ii)	Part B

Table A6.1 PPC Regulated Industrial Processes within the Angus Council Area

Reference	Company	NGR	Brief description	PPC Sec. No.	Part A or B
PPC/B/1000042	Carnoustie Castings 2a Anderson Street Carnoustie	NO 55136 34055	Casting of Iron	2.1b, 2.2a	Part B
PPC/A/1000120	Angus Council Restenneth Landfill Site Montrose Rd Forfar	NO 48381 51396	Waste Management- Non Haz Landfill	5.2 a	Part A
PPC/B/1000147	Laird Bros (Forfar) Ltd, Lunanhead Brickworks, Forfar, DD8 3NQ	NO 47718 52363	Cement Batching	3.1 a(ii)	Part B
PPC/A/1003156	2 Sisters (formerly Joseph Mitchell (Letham) Ltd), 2 Woodside Road, Letham, Forfar, DD8 2QD	NO 5253 4820	Waste Management- Incineration of non haz waste in co- incinerator plant (animal carcass ncinerator)	5.1.e	Part A
PPC/B/1003161	Parkgrove Crematorium,Douglasmuir, Friockheim, DD11 4UN	NO 61444 48810	Crematoria	5.1 c	Part B
PPC/A/1003221	Carbon Filter Technology Ltd, Marywell Works, Kirriemuir	NO 3864 5375	Part A ENERGY- Manufacture of activated carbon cloth	1.2.h	Part A
PPC/A/1004267	Angus Horticulture, Polmood, Guthrie, By Forfar, Angus	NO 58363 52859	CHEMICALS- Converting chemical fertilizers into granules	4.3.b	Part A
PPC/B/1004680	Brechin Service Station, Clerk Street, Brechin	NO 59710 60550	PVR	1.2 c(ii)	Part B
PPC/B/1004715	Morrisons Petrol Station, Hume Street, Arbroath	NO 64042 41245	PVR	1.2 c(ii)	Part B
PPC/B/1004716	Brochtay Service Station, Esso Petrol Station, Dalhousie Road, Broughty Ferry	NO 47940 31598	PVR	1.2 c(ii)	Part B
PPC/B/1004852	Autosales, Lindsay St, Kirriemuir	NO 38409 53356	PVR	1.2 c(ii)	Part B
PPC/B/1004860	Lothian & Borders & Angus Coop, Abbeygate Petrol Station, Academy St, Forfar	NO 46024 50632	PVR	1.2 c(ii)	Part B
PPC/B/1004864	Esso, Guthrie Bros (Craigo) Ltd Petrol Station, 108-126 Northesk Road Montrose	NO 7163 5924	PVR	1.2.c.(ii)	Part B
PPC/B/1004865	Birkhill Auto Point, Alldays Stores Ltd Petrol Station, Couper Angus Rd, Dundee	NO 35188 33941	PVR	1.2 c(ii)	Part B
PPC/B/1004868	Strathtay Retail Ltd, Golden Lion Petrol Station, Montrose Rd, Arbroath	NO 6473 4246	PVR	1.2.c.(ii)	Part B
PPC/B/1004870	Shell Uk Ltd Petrol Station, Queenswell Rd, Forfar	NO 45350 50970	PVR	1.2 c(ii)	Part B
PPC/B/1004874	Cairnie Road Petrol Station Arbroath	NO 62799 41790	PVR	1.2.c.(ii)	Part B
PPC/B/1004877	Stracathro Petrol Station, Stracathro	NO 6286 6480	PVR	1.2.c.(ii)	Part B
PPC/B/1004878	Shell South Esk Petrol Station, Bridge Street, Montrose	NO 7103 5735	PVR	1.2.c.(ii)	Part B
PPC/B/1005109	Brand & Rae Ltd, Cunmont Quarry, Newbigging, Angus, DD5 3PX	NO 49050 36700	Cement Batching	3.1.a.(ii)	Part B
PPC/A/1008876	D Geddes, Border Quarry.	NO 60013 48381	Waste Management – Inert Landfill	5.2 b	Part A
PPC/A/1008878	D Geddes (Contractors) Limited, Ardownie Quarry, Monifieth, Dundee. C	NO 49248 34412	Waste Management – Inert Landfill	5.2 b	Part A
PPC/A/1008879	D Geddes, Prettycur Hillside Montrose.	NO 69692 60908	Waste Management – Inert Landfill	5.2 b	Part A
PPC/A/1008926	Bolshan Quarry, Kinnell, Friockheim.	NO 62078 52634	Waste Management – Inert Landfill	5.2 b	Part A

Reference	Company	NGR	Brief description	PPC Sec. No.	Part A or B
PPC/A/1009964	Hatton Mill Landfil Site, Kinnell, Arbroath, DD11 4UL.	NO 61542 49847	Waste Management – Inert Landfill	5.2 b	Part A
PPC/B/1014546	Wm Morrison Supermarkets Plc, Hume Street, Arbroath, Angus, DD11 1UH	NO 6400 4126	Dry Cleaner	7	Part B
PPC/A/1016291	Kinnell Mill, Friockheim, Arbroath, DD11 4RX	NO 60516 50177	Intensive Agriculture	6.9 a	Part A
PPC/A/1016500	SRCL Arbroath, Elliot Ind Est	NO 62002 40222	Waste Management - Clinical Waste	5.3 a	Part A
PPC/A/1016575	Arnhall Farm, Edzell, Angus, DD9 7UZ	NO 61261 69158	Intensive Agriculture	6.9 a	Part A
PPC/A/1016748	Cransley Farm, Fowlis, Dundee, DD2 5NP	NO 32486 33855	Intensive Agriculture	6.9 a	Part A
PPC/A/1016762	Brathinch Farm, Brathinch, By Brechin, Angus, DD9 7QZ	NO 58867 64162	Intensive Agriculture	6.9 a	Part A
PPC/A/1016785	Tealing Poultry Farm, Tealing, Dundee, DD4 0RD	NO 40602 37182	Intensive Agriculture	6.9 a	Part A
PPC/A/1016831	Oss Group, Sea Oil Base, Ferryden, South Quay, Montrose	NO 71458 56745	Oil Storage	5.3 b	Part A
PPC/A/1016915	Sandyford Farm, Kirriemuir, DD8 5QH	NO 41572 54019	Intensive Agriculture	6.9 a	Part A
PPC/B/1017137	New Wynd Laundry, 66 New Wynd, Montrose, Angus, DD10 8RF	NO 7163 5791	Dry Cleaner	7	Part B
PPC/A/1017311	Finnieston Farm, Letham, Forfar DD8 2SF	NO 51967 50097	Intensive Agriculture	6.9 a	Part A
PPC/A/1017312	Dubton Of Turin, Guthrie DD8 2TY	NO 52922 52727	Intensive Agriculture	6.9 a	Part A
PPC/A/1018798	Aviemore Poultry Farm, Barry, Carnoustie, DD7 7RR	NO 52806 33908	Intensive Agriculture	6.9 a	Part A
PPC/B/1018959	Ospray Forecourts, Monifieth Petrol Station, Monifieth	NO 49788 32541	PVR	1.2.c.(ii)	Part B
PPC/B/1019517	Perfect Laundry & Dry Cleaners, 18 High Street, Carnoustie, DD7 6AQ	NO 5651 3461	Dry Cleaner	7	Part B
PPC/B/1019730	Wm Morrison Supermarkets Plc, Filling Station, Forfar Rd, Dundee, DD4 8AX	NO 41534 32846	PVR	1.2.c.(ii)	Part B
PPC/B/1020969	Laird Brothers (Forfar), Concrete Batching Plant, Lochhead Sand & Gravel Quarry, Gowanbank	NO 4573 5094	Cement Batching	3.1 a(ii)	Part B

Table A6.2 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



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