



BMT Cordah Limited
ENVIRONMENTAL CONSULTANCY
AND INFORMATION SYSTEMS

Detailed Assessment of Local Air Quality

A Report for South Ayrshire Council

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1 INTRODUCTION

The Environment Act 1995 (Reference 1) and subsequent Regulations (References 2-3) require local authorities to undertake a review and assessment of air quality in their area from time to time. The National Air Quality Strategy (NAQS) objectives as defined in the Act and subsequent objectives are provided for reference in Table 1.

The second round of review and assessment commenced in 2003 for which South Ayrshire Council submitted an Updating and Screening Assessment (U&SA) (Reference 4) to the Scottish Executive in May 2003. The report evaluated emission sources and monitoring data for the area against NAQS objectives.

In response to the U&SA, the Scottish Executive asked the Council to provide further evidence to justify one of the report's conclusions, namely that the density of housing burning solid fuel does not exceed the threshold set out in technical guidance LAQM.TG(03) (Reference 5) in any part of South Ayrshire.

Further assessment of the density of housing burning solid fuel within South Ayrshire was undertaken using Council housing records and data obtained during previous studies. The assessment identified two areas where the density of housing burning solid fuel exceeded 100 per 500 m square area. These areas were Tarbolton, a village 10km north-east of Ayr and Dailly, a village situated approximately 8 km north-east of Girvan. The results of the assessment were reported to the Scottish Executive in October 2003 (Reference 6).

As the density of housing burning solid fuel exceeded the thresholds provided in LAQM.TG(03) (Reference 5) it was necessary for the Council to undertake a Detailed Assessment of these areas. In anticipation of this the Council had requested funding from the Scottish Executive to undertake monitoring for PM_{10} . This funding was used to purchase an automatic monitoring station which was located in Dailly.

This report forms South Ayrshire Council's Detailed Assessment report to the Scottish Executive. The report includes a re-assessment of the impact of the housing burning solid fuel in Dailly and Tarbolton using the nomograms contained within technical guidance LAQM.TG(03) (Reference 5) in Section 2 and reports on the monitoring data obtained within the Dailly area in Section 3.

Table 1 Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the Purpose of Local Air Quality Management

Pollutant	Objective		Date to be Achieved By
	Concentration	Measured As	
Benzene	3.25 µg/m ³ (1 ppb)	Annual mean	31.12.10
1,3-butadiene	2.25 µg/m ³ (1 ppb)	Running annual mean	31.12.03
Carbon monoxide	10 mg/m ³ (8.6 ppm)	Max daily running 8-hour mean	31.12.03
Lead	0.5 µg/m ³	Annual mean	31.12.04
	0.25 µg/m ³	Annual mean	31.12.08
Nitrogen Dioxide (NO ₂)	200?g/m ³ (105ppb) not to be exceeded more than 18 times per year ¹	1 hour mean	31.12.05
	40?g/m ³ (21ppb)	Annual mean	31.12.05
Particulates (PM ₁₀)	50?g/m ³ not to be exceeded more than 35 times per year ²	24 hour mean	31.12.04
	40?g/m ³	Annual mean	31.12.04
	50?g/m ³ not to be exceeded more than 7 times per year ³	24 hour mean	31.12.10
	18?g/m ³	Annual mean	31.12.10
Sulphur dioxide (SO ₂)	350?g/m ³ (132ppb) not to be exceeded more than 24 times a year ⁴	1 hour mean	31.12.04
	125?g/m ³ (47ppb) not to be exceeded more than 3 times a year ⁵	24 hour mean	31.12.04
	266?g/m ³ (100ppb) not to be exceeded more than 35 times a year ⁶	15 minute mean	31.12.05

¹ corresponds to the 99.79th percentile concentration of hourly means

² corresponds to the 90th percentile concentration of 24-hour means

³ corresponds to the 98th percentile concentration of 24-hour means

⁴ corresponds to the 99.7th percentile concentration of 1-hour means

⁵ corresponds to the 99th percentile concentration of 24-hour means

⁶ corresponds to the 99.9th percentile concentration of 15-minute means

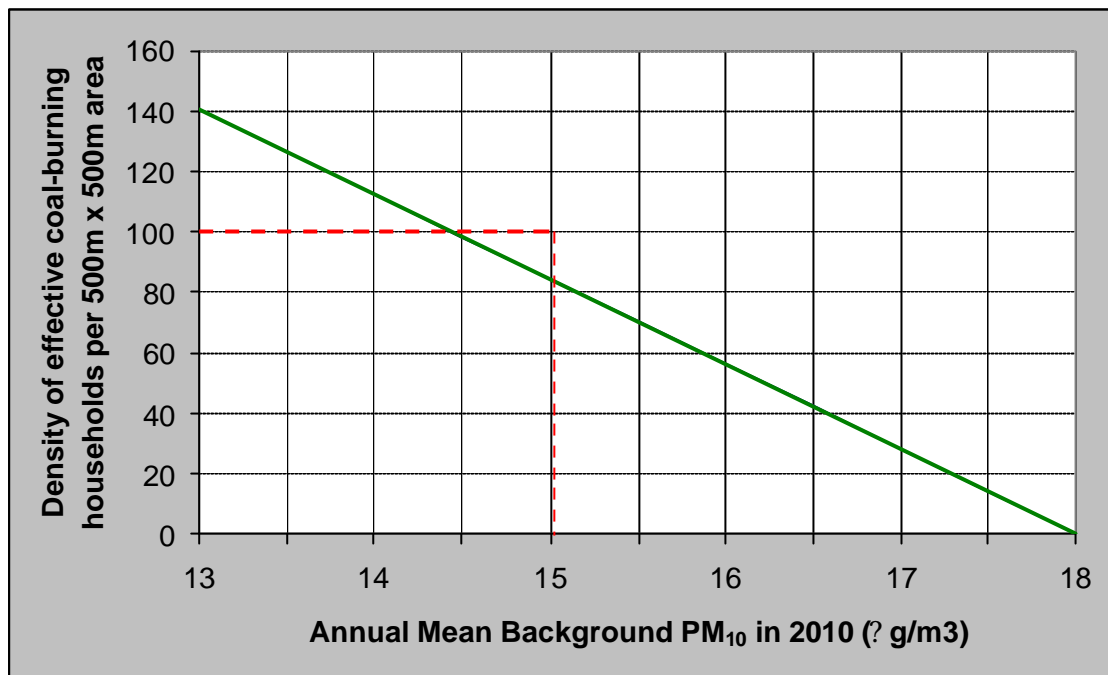
2 NOMOGRAM ASSESSMENT OF DOMESTIC SOLID FUEL BURNING

Technical guidance LAQM.TG(03) (Reference 5) provides a nomogram screening tool for estimating the density of coal burning houses which may give rise to an exceedence of the 2010 annual mean PM₁₀ objective. A copy of the nomogram is provided in Figure 1. In simplified terms the linear plot indicates the density of housing burning coal in a 500m square area (0.25 km²) required to give rise to an annual mean PM₁₀ concentration of 18 µg/m³ for a given background concentration.

The U&SA identified a background concentration of 15 µg/m³ for areas of South Ayrshire outwith Ayr town centre. The hashed lined on the nomogram indicates that, for a background concentration of 15 µg/m³, approximately 80 coal burning houses in a 0.25 km² area would give rise to an exceedence of the 2010 annual mean PM₁₀ objective.

Both Dailly and Tarbolton were identified as having a density of coal burning houses exceeding 100 per 0.25 km² area. Based on the nomogram assessment there is therefore potential for exceedence of the 2010 annual mean PM₁₀ objective.

Figure 1 LAQM.TG(03) Nomogram to estimate density of coal burning properties that would give rise to an exceedence of the 2010 annual mean PM₁₀ objective



3 MONITORING RESULTS

Following the conclusions of the supplementary data to the U&SA (Reference 5) South Ayrshire Council commenced monitoring for PM₁₀ in August 2003. Initially, monitoring is to be undertaken in Dailly, as the worse case of the two villages, and thereafter at Tarbolton. Approximately one year of monitoring data will be obtained for each village.

Monitoring for PM₁₀ is being undertaken using a Tapered Element Oscillating Microbalance (TEOM) unit. The TEOM unit provides continuous data and records the PM₁₀ concentration as a 10-minute average. Following the commencement of monitoring in August technical problems resulted in low data capture from the site from the end of September and throughout October. Since October the data capture rate has improved, with an average data capture rate over the six month period of November to April of 97%. In general, a data capture rate of over 90% is desirable in order to accurately evaluate monitored concentrations against NAQS objectives. The six-month monitoring period from November to April covers the period over which domestic coal burning would be expected to be at a peak. Evaluating the six months of monitoring data against the annual mean NAQS objective therefore represents a worst case scenario.

The respective monthly measured concentrations are summarised in Table 3 whilst the average concentrations over the period are summarised in Table 4. The period averages have been calculated over all months of monitoring, namely from August to May and for the period following the technical problems in October, i.e. from November to May. The reported concentrations have been factored to take account of the under-read of TEOM

analysers against gravimetric sampling techniques. A correction factor of 1.3 has been applied.

Table 2 Monthly Monitoring Data for Dailly

Month	Monthly Mean Concentration ($\mu\text{g}/\text{m}^3$)	Maximum 24-hour Mean Concentration ($\mu\text{g}/\text{m}^3$)	Number of Daily Average Mean Concentrations $>50 \mu\text{g}/\text{m}^3$	Data Capture Rate (%)
August	9.53	13.09	0	17%
September	15.95	27.56	0	83%
October	21.36	23.15	0	8%
November	15.69	25.69	0	86%
December	18.68	30.73	0	98%
January	16.32	31.03	0	100%
February	16.46	23.23	0	100%
March	18.38	37.21	0	100%
April	15.15	34.87	0	100%
May	17.93	77.49	1	100%
June	12.91	25.61	0	100%

Table 3 Period Mean PM_{10} Concentrations

Period	Period Mean Concentration (corrected to gravimetric) ($\mu\text{g}/\text{m}^3$)	Data Capture Rate over Period (%)
August - June	16.75	80.43
November – June	17.10	99.08

The monitoring results therefore indicate that the annual mean concentration for Dailly in 2003/04 will be between 17-18 $\mu\text{g}/\text{m}^3$. The monthly mean concentration, however, exceeded 18 $\mu\text{g}/\text{m}^3$ on two months (excluding October due to the low data capture rate). The potential therefore exists for the annual mean concentration to be above 18 $\mu\text{g}/\text{m}^3$.

The nomogram assessment utilised a general background concentration for South Ayrshire. The Netcen background concentration maps provide location specific background concentrations. The specific background concentration for Dailly (Grid Reference NS 275 015) in 2003/04 is estimated to be 16.59 $\mu\text{g}/\text{m}^3$ in 2003/04. The total PM_{10} contribution from domestic sources is therefore around 1 $\mu\text{g}/\text{m}^3$. In 2010 the background PM_{10} concentration is predicted to be 15.49 $\mu\text{g}/\text{m}^3$. Assuming the contribution to PM_{10} from domestic sources remains constant, the overall PM_{10} concentration in 2010 will be 16.49 $\mu\text{g}/\text{m}^3$.

Based on the measured data and the expected reduction in background PM_{10} concentration over forthcoming years it is considered unlikely that the annual mean PM_{10} concentration in 2010 will exceed 18 $\mu\text{g}/\text{m}^3$.

The 2010 24-hour mean PM_{10} objective level of 50 $\mu\text{g}/\text{m}^3$ was exceeded on one day over the monitoring period. The NAQS objective permits 7 exceedences of the 50 $\mu\text{g}/\text{m}^3$ limit. Analysis of the monitoring data by BMT Cordah revealed that the exceedence was attributable to a single event over a two-hour period on the evening of 12th May. The event and subsequent reduction in concentration suggest that the pollution episode was caused by a local 'incident', such as the generation of a dust cloud. The potential for exceedence of the 24-hour mean objective across the year is therefore considered to be unlikely.

4 CONCLUSIONS

Nomogram assessment of domestic coal burning in Dailly and Tarbolton indicated that there is potential for an exceedence of the 2010 annual mean PM_{10} objective of $18 \mu\text{g}/\text{m}^3$.

Monitoring of PM_{10} levels in Dailly commenced in August 2003. Based on the monitoring results to date it is considered unlikely that there will be an exceedence of either the annual mean or 24-hour mean PM_{10} objectives in 2010. In addition, comparisons between predicted background PM_{10} concentrations and measured concentration indicate that PM_{10} attributable to domestic coal burning comprise $0.5 \mu\text{g}/\text{m}^3$ of the total concentration. As Dailly was considered to be the worse case of the two villages it is therefore considered unlikely that there will be an exceedence of PM_{10} objectives in 2010 in Tarbolton.

5 REFERENCES

- Reference 1 UK National Air Quality Strategy for England, Wales, Scotland and Northern Ireland, Department of Environment, Food and Rural Affairs, January 2003
- Reference 2 Air Quality Regulations, 2000
- Reference 3 Air Quality (Scotland) Regulations 2002
- Reference 4 Local Air Quality Management, Updating and Screening Assessment for South Ayrshire Council, BMT Cordah Limited, May 2003
- Reference 5 Local Air Quality Management, Technical Guidance LAQM.TG(03), Scottish Executive, February 2003
- Reference 6 Correspondence with Scottish Executive (Reference FG/CL), South Ayrshire Council, October 2003