



Environmental
Health

Local Air Quality Management



Updating & Screening Assessment 2006

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South Ayrshire Council

2006 LAQM Updating and Screening Assessment

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EXECUTIVE SUMMARY

The Environment Act 1995 and subsequent regulations requires that local authorities conduct a Review and Assessment of air quality in their area to assess compliance with the standards and objectives set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2000, the Air Quality Regulations 2000 and Air Quality (Scotland) Amendment Regulations 2002 (References.1-3).

This report forms the Updating and Screening Assessment (USA) of the third round of the Review and Assessment process and includes latest available data up to the end of 2005. The report considers the conclusions of the first and second rounds of Review and Assessment and any changes that have occurred since then that would have an effect on local air quality.

The report follows technical guidance LAQM.TG(03), as amended (Reference 4), issued by the Scottish Executive to assist Local authorities in their Review and Assessment of air quality and considers monitoring data and emission sources of each of the seven pollutants included within the National Air Quality Strategy (NAQS) (Reference 1). Where any exceedence of NAQS objectives for any of the seven pollutants is predicted the Council is required to proceed to a Detailed Assessment of those pollutants.

The assessment concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead, nitrogen dioxide and sulphur dioxide are unlikely to exceed any of the respective NAQS objectives and that a detailed assessment is therefore not required. It is predicted that the PM₁₀ concentration is unlikely to exceed the NAQS objectives in 2004 but that it is anticipated that emissions from road traffic and other dust emitting activities may result in an exceedence of the stricter 2010 NAQS objectives. Compliance with the 2010 NAQS objective levels for PM₁₀ will be assessed at the next Updating and Screening Assessment in 2006.

A detailed assessment is therefore not required for South Ayrshire Council. An annual progress report for all seven pollutants will be submitted to the Scottish Executive by April 2007.

INTRODUCTION

1.1 Review and Assessment Framework

The Environment Act 1995 and subsequent regulations require local authorities to conduct a Review and Assessment of air quality in their area to assess compliance with the standards and objectives set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2000 (Reference 1), the Air Quality Regulations 2000 (Reference 2) and Air Quality (Scotland) Amendment Regulations 2002 (Reference 3).

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 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	0.5µg/m ³	Annual mean	31.12.04
	0.25µg/m ³	Annual mean	31.12.08
Nitrogen Dioxide (NO ₂)	200µg/m ³ (105ppb) not to be exceeded more than 18 times per year ¹	1 hour mean	31.12.05
	40µg/m ³ (21ppb)	Annual mean	31.12.05
Particulates (PM ₁₀)	50µg/m ³ not to be exceeded more than 35 times per year ²	24 hour mean	31.12.04
	40µg/m ³	Annual mean	31.12.04
	50µg/m ³ not to be exceeded more than 7 times per year ³	24 hour mean	31.12.10
	18 µg/m ³	Annual mean	31.12.10
Sulphur dioxide (SO ₂)	350µg/m ³ (132ppb) not to be exceeded more than 24 times a year ⁴	1 hour mean	31.12.04
	125µg/m ³ (47ppb) not to be exceeded more than 3 times a year ⁵	24 hour mean	31.12.04
	266µg/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

The framework of local air quality management (LAQM) requires a Review and Assessment of air quality by local authorities on a three yearly basis. The first round of the Review and

Assessment was completed by South Ayrshire Council during 2000 and the second round during 2003. Both the first and second rounds of Review and Assessment by South Ayrshire Council concluded that it was unlikely that there would be any breach of air quality objectives.

This third round of Updating and Screening Assessment (U&SA) considers any changes that have occurred since the second round Review and Assessment that may affect air quality.

Where the U&SA identifies that there may be a risk of an exceedence of an air quality objective at a location with relevant public exposure then a Detailed Assessment must be undertaken. A Detailed Assessment will consider any risk of exceedence of an objective in greater depth in order to determine whether it is necessary to declare an air quality management area.

This report represents the U&SA of air quality within South Ayrshire and follows the guidance laid out in the Technical Guidance document LAQM.TG(03), as amended (Reference 4).

1.2 Description of South Ayrshire

South Ayrshire Council is situated to the south-west of Scotland, on the coast of the mouth of the Firth of Clyde and the Irish Sea. The eastern boundary of the council area lies approximately 30 kilometres inland.

South Ayrshire is neighboured by East Ayrshire to the east, North Ayrshire to the north and Dumfries and Galloway Council to the south.

The main commercial and residential centre of South Ayrshire is Ayr, which is situated on the west coast. The other main populated towns of Prestwick, Troon and Girvan are also situated on the west coast. The inland towns and villages are predominantly small communities, with the exception of Maybole which is a busy town.

The main transportation route within South Ayrshire is the A77. The A77 connects the port of Stranraer, which is in the Dumfries and Galloway Council area to Glasgow. The A77 passes through the main west coast towns and villages from Stranraer to Turnberry at which point it heads inland, through Kirkoswald and Maybole, by-passing the outskirts of Ayr and Prestwick before heading north to Glasgow via Kilmarnock.

Glasgow Prestwick International Airport is situated within South Ayrshire to the outskirts of Ayr and Prestwick. Glasgow Prestwick International Airport serves both international and domestic passenger flights as well as a large amount of freight transportation flights.

A map of the area is included in Figure 1 of Appendix 2.

REVIEW AND ASSESSMENT OF CARBON MONOXIDE

Carbon monoxide (CO) is produced by the incomplete combustion of organic substances. The main source of CO is from vehicle emissions.

The first and second round Review and Assessment of air quality within the South Ayrshire Council (Reference 5 and 6) area concluded that it was unlikely that there would be an exceedence of air quality objectives for CO. The Scottish Executive accepted this conclusion.

The air quality objective for CO as set out in the Air Quality (Amendment) Regulations 2000 is presented in Table 2.

Table 2 Air Quality Objectives for CO

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
Carbon monoxide	10 mg/m ³ (8.6 ppm)	Max daily running 8-hour mean	31.12.03

The maximum running 8-hour mean therefore should not exceed 10 mg/m³.

An assessment of the potential impact of emission sources of CO and available monitoring data is made in Sections 2.1 to 2.4.

2.1 Background Concentration

AEA Technology National Environment Technology Centre (NETCEN) (Reference 9) has mapped the estimated annual mean background CO concentration for the UK including the South Ayrshire Area. The maps are included in Appendix 3. The maps indicate that in 2000 the annual mean background CO concentration was around 0.2 mg/m³. Technical guidance LAQM.TG(03) (Reference 4) provides a correction factor to be applied to 2001 background concentrations to obtain an estimated background concentration for 2003. A factor of 0.826 has therefore been applied to the estimated 2001 concentration giving an estimated background concentration for 2003 of 0.165 mg/m³.

2.2 Monitoring data

South Ayrshire Council does not undertake any monitoring of CO. An estimation of CO concentration has therefore been made utilising monitoring data from the closest national network-monitoring site.

The closest national network-monitoring site to South Ayrshire is Glasgow Centre. The monitoring site in Glasgow is situated within the City Centre therefore it is classified as an Urban Centre site. Concentrations within South Ayrshire are therefore unlikely to be as high as those measured at Glasgow Centre. The maximum daily running 8-hour mean concentrations measured at Glasgow Centre for 1999-2001 are presented in Table 3.

Table 3 Number Of Exceedences Of Objective Concentration For CO Measured in Glasgow
Maximum daily running 8-hour mean concentration > 10 mg/m³

2003	2004	2005
0	0	0

Given that the emissions experienced in Glasgow will be in excess of those experienced within South Ayrshire due to much higher traffic counts, it will be unlikely that the urban background concentration in South Ayrshire will exceed the NAQS objective for CO.

Any potential exceedence of the NAQS objective for CO is therefore expected to be due to a pollution hotspot. The potential impact from road traffic and industrial sources is considered in Section 2.3 and 2.4.

2.3 Road Traffic

Two-thirds of the total emissions of CO in the UK are due to road transport. Technical Guidance LAQM.TG(03) (Reference 4) states that any exceedence of CO objectives is only likely to occur close to very busy roads or junctions.

The technical guidance (Reference 4) states that very busy roads should only be considered where the 2003 annual mean background concentration is expected to be above 1 mg/m³. Since the predicted background CO concentration was 0.165 mg/m³ it is considered unlikely that emissions from any 'very busy roads' will cause exceedence of the NAQS objective for CO. No 'very busy roads' were therefore assessed for CO emissions.

2.4 Industrial Sources

During the first and second rounds of Review and Assessment no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for CO. The Scottish Environment Protection Agency (SEPA), in it's response to the Stage 1 Review and Assessment of air quality in South Ayrshire, agreed with this conclusion.

Consultation with neighbouring local authorities (Reference 10), with SEPA (Reference 11) and reference to the public register at the SEPA offices in East Kilbride did not identify any new industrial processes or existing processes with significantly changed emissions of CO that had potential to cause an exceedence of the NAQS objective.

It is therefore unlikely that there will be any exceedence of the NAQS objective for CO in South Ayrshire as a result of emissions from industrial processors.

2.5 Conclusion

The CO concentrations monitored at the Glasgow Centre AURN site indicate that the NAQS objective for CO is unlikely to be exceeded in an urban environment. South Ayrshire will not be subjected to emissions rates as high as those experienced at the Glasgow Centre site therefore it is unlikely that concentrations will exceed NAQS objective levels within South Ayrshire. In addition it is considered unlikely that there will be any localised exceedence of the NAQS objective for CO as a result of emissions from road traffic or industrial sources.

National studies indicate that the ambient CO concentration is likely to fall in the coming years with a decrease in emissions, particularly from motor vehicles as a result of improved vehicle technology.

It is therefore considered that the maximum running 8-hour mean CO concentration in South Ayrshire will remain below 10 mg/m³ during 2003.

A Detailed Assessment for CO is not required for South Ayrshire Council.

REVIEW AND ASSESSMENT OF BENZENE

Benzene is an additive to petrol for vehicle fuel. The majority of emissions of benzene come from petrol vehicle exhausts.

The first two rounds of Review and Assessment of air quality within the South Ayrshire Council area (References 5 and 6) concluded that it was unlikely that there would be an exceedence of air quality objectives for benzene. The Scottish Executive accepted this conclusion.

The air quality objective for benzene as set out in the Air Quality Regulations 2000 and (amendment) regulations 2002 is presented in Table 4. A stricter objective has also been introduced in Scotland for 2010.

Table 4 Air Quality Objectives for Benzene

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
Benzene	3.25 µg/m ³ (1 ppb)	Annual mean	31.12.10

An assessment of the potential impact of emission sources of benzene and available monitoring data is made in Sections 3.1 to 3.7.

3.1 Background Concentration

NETCEN has mapped estimated annual mean background benzene concentrations for 2001, 2003 and 2010 (Reference 9). The maps are included in Appendix 3. The estimated annual mean concentration in each of the three years is less than 0.3 µg/m³.

3.2 Monitoring Data

Over the last three years South Ayrshire Council has undertaken monitoring of benzene at a total of four sites throughout the Council area.

Monitoring of benzene is undertaken using passive diffusion tubes. The diffusion tubes are left in position for a period of 1 month in every quarter year. The monitored concentration is then averaged over the exposure period. The annual mean concentration measured at each of the sites since 2003 is presented in Table 5.

Table 5 Annual Mean Benzene Concentrations in South Ayrshire

Results expressed in µg/m³

	Annual Mean 2003	Annual Mean 2004	Annual Mean 2005
Camerons Garage, Maybole	2.3	2	2.1
Safeway, Maybole	1.1	1	1
Town Hall Maybole	1.0	0.9	1.0
Rozelle Park Ayr	0.3	0.3	0.3

The maximum annual mean concentration of benzene measured throughout South Ayrshire between 2003 and 2005 varies from 0.3 to 2.3 µg/m³. The concentrations are substantially below the NAQS level 3.25 µg/m³ due to be achieved by 31.12.2010.

3.3 Road Traffic

Technical guidance document LAQM.TG(03), as amended (Reference 4) states that local authorities need only consider emissions from 'very busy roads' where the 2010 background is expected to be above 2 µg/m³. The estimated 2010 background concentration for South Ayrshire taken from the NETCEN maps was less than 0.3 µg/m³. Emissions from road traffic are therefore not considered likely to result in an exceedence of LAQM objectives for benzene.

3.4 Industrial Sources

During the first and second rounds of Review and Assessment no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for benzene. SEPA agreed with this conclusion in its responses to the Stage 1 and two Review and Assessment of air quality in South Ayrshire.

Consultation with neighbouring local authorities, with SEPA (References 10 & 11) and reference to the public register at the SEPA offices in East Kilbride did not identify any new industrial processes or existing processes with significantly changed emissions of benzene that had potential to cause an exceedence of the NAQS objective.

It is therefore concluded that it is unlikely that there will be any exceedence of the NAQS objective for benzene in South Ayrshire as a result of emissions from industrial processors.

3.5 Petrol Stations

The technical guidance document LAQM.TG(03), as amended (Reference 4.) states that there is a potential for an exceedence of the 2010 objective for benzene where emissions from large petrol stations are combined with emissions from nearby busy roads.

A busy road is defined as a road with an annual average daily traffic flow greater than 30,000 vehicles per day. No roads surveyed by South Ayrshire Council in 2002 had traffic flows exceeding 30,000.

It is unlikely therefore that there will be any exceedence of the 2010 benzene objective as a result of emissions from petrol stations.

3.6 Major Fuel Storage Depots

There are no major fuel depots situated within the South Ayrshire Council area as described in the technical guidance document LAQM.TG(03), as amended (Reference 4.)

3.7 Conclusion

Monitoring of benzene undertaken throughout South Ayrshire indicates that the NAQS 2010 objective for benzene is unlikely to be exceeded therefore no detailed assessment is required. No emissions sources of benzene were identified that are considered likely to cause any other localised exceedence of the NAQS objectives for benzene.

4 REVIEW AND ASSESSMENT OF 1,3-BUTADIENE

The primary sources of 1,3-butadiene are vehicle emissions and industrial processes. Catalytic converters remove a high percentage of emissions of 1,3-butadiene from motor vehicles. The first and second rounds of Review and Assessment of air quality within the South Ayrshire Council area (References 5 and 6) concluded that it was unlikely that there would be an exceedence of air quality objectives for 1,3-butadiene. The Scottish Executive accepted this conclusion.

The air quality objective for 1,3-butadiene as set out in the Air Quality Regulations 2000 is presented in Table 6.

Table 6 Air Quality Objective For 1,3-Butadiene

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
1,3-butadiene	2.25 µg/m ³ (1 ppb)	Running annual mean	31.12.03

An assessment of the potential impact of emission sources of 1,3-butadiene and available monitoring data is made in Sections 4.1 to 4.3.

4.1 Background Concentrations

NETCEN (Reference 9) has mapped estimated annual mean background 1,3-butadiene concentrations for 2001 and 2003. The maps are included in Appendix 3. The estimated annual mean concentration for both years is below 0.1 µg/m³.

4.2 Monitoring Data

South Ayrshire Council does not currently undertake monitoring of 1,3-butadiene. The Council did monitor 1,3-butadiene at fifteen sites throughout the area during 1998 and 1999. No exceedences of the NAQS annual mean concentration for 1,3-butadiene were measured.

The closest national network-monitoring site to South Ayrshire is at Glasgow, a kerbside site. There were no exceedences of the NAQ objective concentration in 2003, 2004 or 2005. The running annual mean concentrations measured at the site are presented in Table 7. (There was insufficient capture rate in 2004 to include the figures for that year).

Table 7 Running Annual Mean 1,3-butadiene Concentrations

Results expressed in µg/m³

	2003	2005
Glasgow Kerbside	0.42	0.21

The running annual mean concentrations measured at Glasgow are therefore well below both the NAQS objectives for 1,3-butadiene. Ambient 1,3-butadiene concentrations in South Ayrshire will be expected to be lower than those experienced in Glasgow. It is therefore considered unlikely that there will be an exceedence of NAQS objective concentrations for 1,3-butadiene in South Ayrshire.

4.3 Industrial Sources

During the first and second rounds of Review and Assessment no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for 1,3butadiene. SEPA agreed with this conclusion in its response to the Stage 1 and 2 Review and Assessment of air quality in South Ayrshire.

Consultation with neighbouring local authorities, with SEPA (References 10 & 11) and reference to the public register at the SEPA offices in East Kilbride did not identify any new industrial processes or existing processes with significantly changed emissions of 1,3-butadiene that had potential to cause an exceedence of the NAQS objective.

It is therefore concluded that it is unlikely that there will be any exceedence of the NAQS objective for benzene in South Ayrshire as a result of emissions from industrial processors.

4.4 Conclusion

Monitoring of 1,3-butadiene undertaken within South Ayrshire and Glasgow indicates that the NAQS objective for 1,3 butadiene is unlikely to be exceeded in urban locations. It is therefore concluded that ambient 1,3 butadiene concentrations are unlikely to exceed NAQS objective levels.

No emissions sources were identified that are considered likely to cause a localised exceedence of the NAQS objective for 1,3 butadiene.

Technical guidance document LAQM.TG(03) as amended (Reference 4) states that a number of national policy measures are expected to further reduce emissions of 1,3 butadiene from road vehicles.

It is therefore considered unlikely that there will be any exceedence of the NAQS objective for 1,3-butadiene.

A Detailed Assessment for 1,3-butadiene is not required for South Ayrshire.

REVIEW AND ASSESSMENT OF LEAD

Since the addition of lead to petrol was banned in 2000, the principal source of lead is from industrial emissions.

The first and second rounds of Review and Assessment of air quality within the South Ayrshire Council area (References 5 and 6) concluded that it was unlikely that there would be an exceedance of air quality objectives for lead. The Scottish Executive accepted this conclusion.

The air quality objective for lead as set out in the Air Quality Regulations 2000 is presented in Table 8.

Table 8 Air Quality Objectives for Lead

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
Lead	0.5 µg/m ³	Annual mean	31.12.04
	0.25 µg/m ³	Annual mean	31.12.08

The running annual mean therefore must not exceed 0.5 µg/m³ by the end of 2004 and 0.25 µg/m³ by the end of 2008.

An assessment of the potential impact of emissions sources of lead and available monitoring data is presented in Sections 5.1 to 5.3.

5.1 Monitoring data

South Ayrshire Council does not routinely undertake any monitoring for lead. The Council has however undertaken two three-month lead monitoring programmes, one in 2000 and one in 2002. The lead monitoring results during the two monitoring periods are shown in Table 9.

Table 9 Lead-in-air Concentrations monitored in South Ayrshire

Results expressed in µg/m³

	Site Concentration 2000	Period 2000	Mean	Site Concentrations 2002	Period	Mean
Girvan	0.12			<0.05		
Maybole	0.09			<0.05		
Ayr	0.09			<0.05		
Prestwick	0.15			<0.05		

The two closest network monitoring stations are situated in Glasgow and Motherwell. The monitoring site in Glasgow is situated in the east end of the city in an area that formerly contained a number of small foundries. No foundries are still in operation in the area, the area now being mainly residential. The monitoring site in Motherwell is situated about 500m from a large steel mill and is adjacent to several main roads.

Those results are presented in Table 10 for comparative purposes.

Table 10 Annual Mean Lead-in-air Concentrations At Glasgow And Motherwell National Network Monitoring Sites

Results expressed in $\mu\text{g}/\text{m}^3$

	2003	2004	2005
Glasgow	0.015	0.014	0.013
Motherwell	0.010	0.008	0.007

The annual mean lead-in-air concentrations measured in South Ayrshire are below NAQS objective levels. The lead-in-air concentrations in South Ayrshire are comparable to those measured at both Glasgow and Motherwell.

The monitoring results therefore demonstrate that it is unlikely that the NAQS objectives will be exceeded.

5.2 Industrial Sources

During the first and second rounds of Review and Assessment no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for lead. SEPA agreed with this conclusion in it's response to the Stage 1 and 2 Review and Assessment of air quality in South Ayrshire.

Consultation with neighbouring local authorities, with SEPA (References 10 & 11) and reference to the public register at the SEPA offices in East Kilbride did not identify any new industrial processes or existing processes with significantly changed emissions of lead that had potential to cause an exceedence of the NAQS objective.

It is therefore concluded that it is unlikely that there will be any exceedence of the NAQS objective for lead in South Ayrshire as a result of emissions from industrial processors.

5.3 Conclusion

Monitoring of lead undertaken in South Ayrshire and at network monitoring sites in Glasgow and Motherwell indicate that the NAQS objective is unlikely to be exceeded in urban locations.

As lead in petrol is now banned, use of lead is now restricted to certain industrial processes. Ambient lead concentrations are therefore expected to remain fairly constant in the future.

No emissions sources were identified that are considered likely to cause a localised exceedence of the NAQS objective for lead.

It is therefore considered unlikely that there will be any exceedence of the NAQS objective for lead.

REVIEW AND ASSESSMENT OF NITROGEN DIOXIDE

Primary sources of nitrogen dioxide (NO₂) are from vehicle engines and combustion processes. NO₂ is also generated by the reaction of oxides of nitrogen (NO_x) and atmospheric ozone (O₃).

The first and second rounds of Review and Assessment of air quality within the South Ayrshire Council area concluded that it was unlikely that there would be an exceedence of air quality objectives for NO₂. The Scottish Executive accepted this conclusion.

There are two air quality objectives for NO₂, an annual mean objective and an hourly objective, set out in the Air Quality Regulations 2000. The objectives are presented in Table 11.

Table 11 Air Quality Objectives for Nitrogen Dioxide

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
Nitrogen Dioxide (NO ₂)	200µg/m ³ (105ppb) not to be exceeded more than 18 times per year ¹	1 hour mean	31.12.05
	40µg/m ³ (21ppb)	Annual mean	31.12.05

The annual mean concentration therefore should not exceed 40µg/m³ by the end of 2005. In addition it should be predicted that there will be fewer than 18 hourly exceedences of 200µg/m³ in a year by the end of 2005.

An assessment the potential impact of emission sources of NO₂ and available monitoring data is made in Sections 6.1 to 6.6.

6.1 Background Concentration

NETCEN (Reference 9) has mapped estimated annual mean background concentrations for both NO_x and NO₂ for the years 2001, 2005 and 2010. The maps are included in Appendix 2

The estimated annual mean NO_x concentration for all three years is below 20µg/m³. The NO₂ component of total NO_x is predicted to be between 15-20 µg/m³ for South Ayrshire during 2001 but is predicted to fall to between 10-15 µg/m³ for the whole of the Council area in both 2005 and 2010. The exception to this is around Ayr and Glasgow Prestwick International Airport where the NO₂ concentration is predicted to remain between 15-20 µg/m³ in 2005 and 2010.

6.2 Monitoring Data

South Ayrshire Council monitors NO₂ at a number of sites within the area. Monitoring is undertaken using passive diffusion tubes. Monitoring has been undertaken at a total of thirty-four sites since 2000. The sites at which monitoring has been undertaken have changed through time. A discussion of the analysis of the diffusion tubes is discussed in Section 6.2.1 with the results presented in Section 6.2.2.

6.2.1 QA/QC of Diffusion Tube Monitoring Data

The laboratory analysis of the passive diffusion tubes used by South Ayrshire Council is undertaken by Glasgow Scientific Services (GSS). GSS are UKAS accredited for the analysis of NO₂ diffusion tubes. GSS prepare diffusion tubes using 50% TEA in acetone. Up until mid-2001 the preparation method was 20% TEA in water.

Diffusion tube monitoring is not as accurate as continuous monitoring techniques. The technical guidance LAQM.TG(03) (Reference 4) recommends that diffusion tubes should be co-located with chemiluminescence analysers to compare the results in order to validate the performance of the diffusion tubes and analysis technique. This performance is assessed by calculating laboratory bias and all diffusion tubes analysed at the same laboratory must have their results corrected to allow for the bias.

South Ayrshire Council does not have a chemiluminescent analyser and so the comparison is not possible. However, diffusion tubes analysed by Glasgow Scientific Services have been co-located by Glasgow City Council with the chemiluminescence analysers at the national network sites at Glasgow Centre, Glasgow City Chambers and Glasgow Kerbside. In addition Glasgow City Council co-locates diffusion tubes with two non-national network automatic monitoring sites within the city. The findings of these co –location studies have been incorporated into an Excel spreadsheet by the University of The West of England. The spreadsheet is updated regularly and the edition utilised here was created on 31st March 2006. The bias correction factors are displayed in Table 12.

Table 12 Bias Correction Factors For NOX Diffusion Tubes

		2003	2004	2005
Glasgow Services	Scientific	0.78	0.83	0.74

6.2.2 Monitoring Results

South Ayrshire Council has conducted monitoring of NO₂ using diffusion tubes at thirty-four sites since 2000. The site locations and descriptions are presented in Table 13. The locations are plotted in a series of figures in Appendix 2.

The monitoring locations were selected to provide monitoring data from several key areas within the South Ayrshire Council region. Roadside and kerbside sites were chosen for monitoring in accordance with national guidance as the most likely areas of high NO₂ concentrations.

The NO₂ concentrations measured at these sites are presented in Table 13. The concentrations have been adjusted for laboratory bias using the excel spreadsheet provided by University of The West of England.

Table 13 Annual Mean NO₂ Concentrations in South Ayrshire

		2003		2004		2005	
Location		Data Capture	Results µg/m ³	Data Capture	Results µg/m ³	Data Capture	Results µg/m ³
Ayr College	Kerbside	100%	13	100%	13	100%	11
Heathfield PS	Kerbside	92%	18	100%	15	83%	14
Prestwick Rd	Kerbside	92%	32	92%	30	100%	28
Beresford Terr	Kerbside	92%	39	100%	30	100%	27
Tesco Ayr	Kerbside	100%	18	100%	18	100%	17
Kingcase Garage	Kerbside	92%	25	100%	23	100%	21
Shaw Rd	Kerbside	100%	16	92%	16	100%	16
P/wick Holiday	Kerbside	50%	9	--	--	--	--
Shaw Farm Rd	Kerbside	--	--	100%	13	100%	12
Dundonald	Kerbside	100%	10	100%	10	100%	8
Kilmarnock Rd	Kerbside	100%	18	100%	15	100%	13
Templehill Troon	Kerbside	100%	13	100%	11	100%	9
Ardneils Troon	Kerbside	83%	13	92%	11	100%	10
Loans	Kerbside	100%	13	100%	11	100%	11
Coylton	Kerbside	100%	12	100%	11	100%	11
Mossblown	Kerbside	92%	13	100%	11	100%	10
Monkton	Kerbside	58%	15	100%	15	92%	14
Dalrymple St	Kerbside	100%	19	92%	17	92%	15
Henrietta Street	Kerbside	92%	13	92%	7	100%	8
Camerons M/bole	Kerbside	100%	25	100%	21	100%	22
Craigie Garden Centre	Urban B/G	100%	8	100%	5	92%	5
Rozelle Park Ayr	Urban B/G	100%	7	92%	4	100%	4
Town Bldgs Ayr	Kerbside	92%	30	100%	30	83%	30

The monitoring results therefore indicate that NO₂ concentrations are below the NAQS annual mean objective for NO₂.

The technical guidance LAQM.TG(03) as amended (Reference 4) suggests that meeting the 2005 annual mean objective is expected to be more demanding than meeting the hourly mean objective. Hourly monitoring data is unavailable for South Ayrshire. As the annual mean objective has been met it is considered unlikely that the hourly mean objective will be exceeded.

Any potential exceedence of the NAQS objective for NO₂ is therefore expected to be due to a pollution hotspot. The emissions sources with the potential to cause pollution hotspots of NO₂ are road traffic and industrial sources. While monitoring has been chosen to check concentrations at

potential hot-spots, road traffic industrial sources and airports are considered to further in Sections 6.3, 6.4 and 6.5.

6.3 Road Traffic

In the first and second rounds of Review and Assessment report (Reference 5 and 6) consideration was given to emissions from roads in South Ayrshire. Assessment was made using the nomograms contained in Technical Guidance document LAQM.TG(00) (Reference 13) and the method described in the Design Manual for Roads and Bridges (DMRB) (Reference 14).

No roads were predicted to have emissions likely to cause an exceedence of air quality objectives for NO₂.

This finding was accepted by the Scottish Executive.

Information from South Ayrshire Strategy and Design service indicates that there has not been a substantial increase in traffic counts since the last Review and Assessment report in 2003.

A table of annual average daily traffic flow and average vehicle speeds for the roads in South Ayrshire is included in Appendix 4.

Road traffic flow data for two roads was provided by the Scottish Executive and road traffic flows for three roads was provided by South Ayrshire Council. These results are shown as a comparison to the 2002 data and detailed in Table 14.

Table 14 Comparison of Total Monthly Traffic Flows in South Ayrshire for 2002 and 2005

	2002	2005	% Increase
Maybole Road, Ayr	(April) 4858	(April) 5034	+3.6%
High Road, Whitletts, Ayr	(April) 17324	(April) 17587	+1.5%
Heathfield Road Ayr	(April) 18654	(April) 19060	+2.2%
Ayr Road Prestwick	(April) 19060	(April) 19378	+1.6%
A77 South Of Girvan	(June) 177750	(June) 192992	+8.6%
A77 Minishant	(April) 365983	(April) 395213	+1.1%

There has been only a slight increase in volume of road traffic in the three years since the last USA and it is therefore likely that the assessments carried out in 2002 will still be valid and there will be no exceedences of the NAQ objective limit.

6.4 Industrial Sources

During the first and second rounds of Review and Assessment, no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for NO₂. SEPA agreed with this conclusion in its response to the Stage 1 and Stage 2 Review and Assessment of air quality in South Ayrshire. Consultation with neighbouring local authorities, with SEPA (Reference 10 and 11) and reference to the public register at the SEPA offices in East Kilbride did not identify any new industrial processes or existing processes with

significantly increased emissions of NO₂ that had potential to cause an exceedance of the NAQS objective.

It is therefore concluded that it is unlikely that there will be any exceedance of the NAQS objective for NO₂ in South Ayrshire as a result of emissions from industrial processors.

6.5 Air Traffic

Glasgow Prestwick International Airport is situated within South Ayrshire to the north-east of Ayr and Prestwick. Glasgow Prestwick International Airport services operate international charter and schedule passenger flights as well as freight transportation.

Technical guidance LAQM.TG(03) as amended (Reference 4) states that aircraft generated emissions from airports with a throughput in excess of 5 million passengers equivalent per annum (mppa) may give rise to an exceedance of NAQS annual mean objectives for NO₂.

In 2005 Glasgow Prestwick International Airport had a passenger throughput of 2,388,537 passengers per annum (mppa) and an annual freight throughput of 29,675 tonnes per annum. Technical guidance LAQM.TG(03) as amended (Reference 4) states that 100,000 tonnes freight per annum is the equivalent of 1 mppa. The passenger equivalent of freight throughput at Glasgow Prestwick International Airport is therefore 0.3 mppa. The total equivalent passenger throughput at Glasgow Prestwick International Airport in 2005 was therefore 2.7 mppa.

Section 6.48 Technical Guidance LAQM. TG(03) states that authorities need only consider airports that exceed 5 mppa or equivalent (in 2005 or 2010) and/or where the 2005 NO_x background concentration exceeds 25µg/m³. Diffusion tube results around the airport fall well below this level. Aircraft generated emissions from Glasgow Prestwick International Airport are therefore considered unlikely to exceed the NAQS objectives for NO₂. No further assessment of aircraft generated emissions is therefore required.

6.6 Conclusion

Monitoring of NO₂ undertaken in South Ayrshire indicates that the NAQS objective is unlikely to be exceeded in urban background locations. It is therefore concluded that ambient NO₂ concentrations are unlikely to exceed NAQS objective levels.

The results of the DMRB Assessment previously carried out shows that emissions from road traffic are not likely to cause exceedance of the annual mean NAQS objective in 2005. Further assessment of traffic generated NO₂ emissions is therefore not required.

Aircraft generated emissions from Glasgow Prestwick International Airport are considered unlikely to exceed the NAQS objectives for NO₂. No further assessment of aircraft generated emissions is therefore required.

No other emissions sources were identified that are considered likely to cause a localised exceedance of the NAQS objectives for NO₂. The NAQS objectives for NO₂ are not expected to be exceeded for NO₂ it is therefore not required for South Ayrshire Council.

REVIEW AND ASSESSMENT OF SULPHUR DIOXIDE

The principal source of emissions of sulphur dioxide (SO₂) is from coal-fired power stations and other industrial combustion sources. Emissions from motor vehicles are minimal in comparison.

The first and second rounds of Review and Assessment of air quality within the South Ayrshire Council area (References 5 and 6) concluded that it was unlikely that there would be an exceedence of air quality objectives for SO₂. The Scottish Executive accepted this conclusion.

There are three air quality objectives for SO₂, an hourly mean objective, a 24-hour objective and a 15-minute mean objective, set out in the Air Quality Regulations 2000. The objectives are presented in Table 15.

Table 15 Air Quality Objectives for Sulphur Dioxide (SO₂)

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
Sulphur dioxide (SO ₂)	350µg/m ³ (132ppb) not to be exceeded more than 24 times a year	1 hour mean	31.12.04
	125µg/m ³ (47ppb) not to be exceeded more than 3 times a year	24 hour mean	31.12.04
	266µg/m ³ (100ppb) not to be exceeded more than 35 times a year	15 minute mean	31.12.05

The predicted ground level concentration therefore should not exceed 350µg/m³ on more than 24 hourly periods by the end of 2005. In addition it should be predicted that the 24hour mean will not exceed 125µg/m³ on more than three occasions by the end of 2004 and that there will be fewer than 35 15-minute mean exceedences of 266µg/m³a year by the end of 2005.

An assessment the potential impact of emission sources of SO₂ and available monitoring data is made in Sections 7.1 to 7.7.

7.1 Background Concentration

NETCEN (Reference 6) has mapped estimated annual mean background concentrations for SO₂ during 2001. The map is included in Appendix 2.

The estimated annual mean SO₂ concentration in South Ayrshire in 2001 is between 2-4 µg/m³. Technical guidance LAQM.TG(03) as amended (Reference 4) suggests that the annual mean SO₂ background concentration at the end of 2004 and 2005 will be 75% of the 2001 concentration. The background annual mean concentration during 2004 and 2005 is therefore predicted to be between 1-3 µg/m³.

7.2 Monitoring Data

Previously, the Council monitored SO₂ using passive diffusion tubes. The diffusion tube technique was not validated, and as the monitoring averaging period was 3-monthly the results are not comparable with NAQS objectives for SO₂.

However, the monitoring results can therefore be used as an indicator of air quality but not directly compared with NAQS objectives. The results although not directly comparable were lower than any of the NAQS objectives for SO₂. South Ayrshire Council received Special Capital funding in 2001 to purchase two 8 port bubblers to monitor SO₂, which have been

located at Dundonald Activity Centre and at the Council's Roads Depot within Grangeston Industrial Estate Girvan.

The 8 port bubblers have been in operation since November 2002 and the results of those are displayed in table 15. The monitoring locations are plotted in a series of figures in Appendix 2. Analysis of the solution takes place at Glasgow Scientific Services.

The SO₂ bubblers monitor over 24 hour periods. The annual mean concentration and the maximum 24 hour mean concentration monitored at the site are presented in table 16, technical guidance LAQM TG (03) as amended provides a correction factor to adjust mean concentrations for comparison with hourly and fifteen minute mean objectives, the correction factors are: 99.9th percentile of fifteen minute means = 1.8962 x the maximum daily mean 99.7th percentile of one hour mean = 1.63691 x maximum daily mean

7.3 QA/QC of SO₂ Bubblers

The production of the solution and analysis of the dreschel bottles is undertaken by Glasgow Scientific Services (GSS). The equipment is serviced in accordance with the manufacturer's recommendations and the flow rate is checked weekly. Guidance contained within the "UK Smoke and SO₂ Networks instruction manual" is followed. Box 7.3, technical guidance LAQM TG (03) states that where net acidity measurements are made, the measured maximum daily mean concentration should be multiplied by 1.25 to take account of a general tendency for bubblers to under – read. The correction factors have been utilised in the results are also presented in table 16.

SO₂ Concentration measured at both these locations is significantly lower than the objective levels and it is therefore unlikely that any of the NAQS objectives for SO₂ will be exceeded within South Ayrshire. The results of the monitoring within South Ayrshire are presented in Table 16.

Table 16 SO₂ Concentrations in South Ayrshire

	Dundonald			Girvan			Equivalent Objective Standard (µg/m ³)
	2003	2004	2005	2003	2004	2005	
Annual Mean Concentration (µg/m ³)	15	15	15	18	15	19	-
Maximum Daily mean Concentration (µg/m ³)	46	66	75	61	39	99	125
99.7th percentile of 1-hour Means (µg/m ³)	64	91	122	84	52	161	350
99.9th percentile of 15-minute Means (µg/m ³)	8870	124	142	115	72	188	266

The closest national network monitoring site to South Ayrshire is Glasgow Centre. The monitoring site in Glasgow is situated within the City Centre therefore it is classified as an Urban Centre site. Concentrations within South Ayrshire are therefore unlikely to be as high as those measured at Glasgow Centre. No exceedences of NAQS objectives for SO₂ have been measured at the Glasgow Centre site during 2003, 2004 or 2005.

It is therefore considered unlikely that the ambient SO₂ concentration in South Ayrshire will exceed the NAQS objective levels.

Any potential exceedence of the NAQS objective for SO₂ is therefore expected to be due to a pollution hotspot. The emissions sources with the potential to cause pollution hotspots of SO₂ are industrial and combustion sources. While monitoring has been chosen to check concentrations at potential hot-spot, industrial and combustion sources are considered further in Sections 7.4 and 7.5.

7.4 Industrial Sources

During the first and second round of Review and Assessment, no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for SO₂. SEPA agreed with this conclusion in its responses.

Consultation with neighbouring local authorities, with SEPA (References 10 & 11) and reference to the public register at the SEPA offices in East Kilbride did not identify any new industrial processes or existing processes with significantly increased emissions of SO₂ that had potential to cause an exceedence of the NAQS objective.

Wm Grant and Sons, a distillery in Girvan has commissioned a new combined heat and power energy centre since the first round of Review and Assessment. An air quality impact assessment undertaken by BMT Cordah Limited in concluded that emissions of SO₂ would be reduced from the site as a result of the development and there were no predicted exceedences of any of the SO₂ NAQS objectives.

It is therefore concluded that it is unlikely that there will be any exceedence of the NAQS objective for SO₂ in South Ayrshire as a result of emissions from industrial processors.

7.5 Domestic Coal Burning

Technical guidance LAQM.TG(03) as amended (Reference 4) indicates that local exceedences of SO₂ objectives may occur in areas of concentrated coal burning. Concentrated areas are defined as those with more than 100 properties burning coal in an area of 500m by 500m.

Information provided by South Ayrshire Council suggests that there are no areas of concentrated coal burning. The villages of Tarbolton, Mossblown, Annbank and Dailly were identified as having more than 50 properties capable of burning coal. However, the area of each of these villages is greater than 0.25 km². From the information available, the number of coal burning properties therefore does not exceed 100 houses per 0.25 km². It is therefore considered unlikely that there will be any exceedence of NAQS objectives for SO₂ as a result of emissions from domestic coal burning.

This conclusion is supported by the absence of any complaints to South Ayrshire Council of smoke from domestic dwellings.

7.6 Small Boilers

An assessment of small boilers greater than five megawatt thermal output was undertaken during South Ayrshire Council's Stage 2 Review and Assessment (Reference 6). No small boilers were identified with potential to cause an exceedence of NAQS objectives for SO₂.

No new boilers of a thermal output of five megawatts or more burning coal or heavy fuel oil have been commissioned since the Stage 2 report was completed.

It is therefore considered unlikely that there will be an exceedance of NAQS objectives for SO₂ as a result of emissions from small boilers.

7.7 Shipping

There are a number of small ports and harbours along the South Ayrshire coast. With the exception of Troon, the harbours service mainly fishing and leisure vessels. Troon harbour is the departure point for the fast ferry services to Belfast. The ferry makes 2-3 sailings a day from the harbour.

Technical guidance LAQM.TG(03) (Reference 4) states that there is potential for an exceedance of NAQS objectives for SO₂ within 1km of the main berths of large ports with more than 5000 large ship movements per year. LAQM Updating and Screening Assessment South Ayrshire Council

No ports or harbours in South Ayrshire have shipping movements of these levels therefore it is considered unlikely that there will be an exceedance of NAQS objectives for SO₂.

7.8 Railways

Passenger rail services through South Ayrshire connect Glasgow to Ayr and Stranraer. All services terminate or pass through Ayr station. Train services that terminate at Ayr station are electrically powered, the remainder being diesel powered. The diesel-powered services travel south to Girvan and Stranraer approximately ten times per day.

Technical guidance LAQM.TG(03) (Reference 2) states that potential exists for an exceedance of the 15-minute NAQS objective for SO₂ where diesel locomotives remain stationary with their engine running for periods of fifteen minutes or more.

There are no scheduled stops of diesel passenger trains within South Ayrshire of longer than two minutes. It is therefore considered unlikely that there will be any exceedance of the 15-minute NAQS SO₂ objective.

7.9 Conclusion

Monitoring of SO₂ previously undertaken in South Ayrshire, although not by a monitoring method directly comparable with NAQS objectives, indicates that the NAQS objectives are unlikely to be exceeded in urban background locations. It is therefore concluded that ambient SO₂ concentrations are unlikely to exceed NAQS objective levels.

No emissions sources were identified that are considered likely to cause a localised exceedance of the NAQS objectives for SO₂.

A Detailed Assessment for SO₂ is therefore not required for South Ayrshire.

REVIEW AND ASSESSMENT OF PARTICLES (PM₁₀)

PM₁₀ comprises a variety of substances of less than 10 microns (µm) in diameter.

PM₁₀ is produced from a variety of sources. The principal sources are road transport, combustion processes and quarrying and mining. PM₁₀ can also arise from a variety of natural sources including sea salt, pollen grains and biological particles.

PM₁₀ can be classified as being either primary or secondary. Primary sources are released directly into the atmosphere, from combustion processes whilst secondary sources are formed by chemical reaction in the atmosphere. The formation of secondary particles can occur a distance away from their origin. The smaller particles (<2 µg/m³) are defined as fine whilst larger diameter particles (2-10 µg/m³) are defined as being coarse.

The first and second rounds of Review and Assessment of air quality within the South Ayrshire Council area (References 5 and 6) concluded that it was unlikely that there would be an exceedance of air quality objectives for PM₁₀. The Scottish Executive accepted this conclusion. A detailed assessment was carried out in 2004 for Dailly village (Reference 7) as it was shown to have the highest incidence of coal burning appliances within South Ayrshire. A continuous TEOM PM₁₀ monitor was utilised for this purpose. The finding of the subsequent report was that there was no exceedance of the NAQ objective standard. This was accepted by both SEPA and the Scottish Executive.

There are two air quality objectives for PM₁₀, an annual mean objective and a daily mean objective, set out in the Air Quality Regulations 2000. In addition the Scottish Executive has set in place stricter objectives to be achieved by 2010. The objectives are presented in Table 18.

Table 17 Air Quality Objectives for Particles

Pollutant	Objective Concentration	Measured As	Date to be Achieved By
Particulates (PM ₁₀)	50µg/m ³ not to be exceeded more than 35 times per year ²	24 hour mean	31.12.04
	40µg/m ³	Annual mean	31.12.04
	50µg/m ³ not to be exceeded more than 7 times per year ³	24 hour mean	31.12.10

The annual mean concentration therefore should not exceed 40 µg/m³ by the end of 2004 and 18 µg/m³ by the end of 2010. In addition it should be predicted that there will be fewer than 35 24-hourly exceedances of 50 µg/m³ in a year by the end of 2004 and less than 7 by the end of 2010.

An assessment the potential impact of emission sources of PM₁₀ and available monitoring data is made in Sections 8.1 to 8.7.

8.1 Background Concentration

NETCEN has mapped estimated annual mean background concentrations for primary PM₁₀ concentrations during 2001, 2004 and 2010, and secondary PM 10 concentrations for 2001(Reference 9). The maps are included in Appendix 2.

The estimated primary annual mean PM₁₀ concentration in 2001 is between 15-18 µg/m³. The background concentration is also predicted to be between 15-18 µg/m³ in 2004 but expected to fall below 15 µg/m³ by 2010. The estimated secondary annual mean concentration in 2001 was

estimated to be below 3 µg/m³. It is assumed that secondary PM₁₀ concentration will remain constant until 2010.

The total background concentration during 2004 is therefore predicted to be 18 µg/m³ whilst it will be 15 µg/m³ in 2010.

QA/QC Procedures

The monitors are all regularly serviced and calibrated in accordance with the manufacturers recommendations. In addition all data is screened and any erroneous data excluded from the calculations.

8.2 Monitoring Data

South Ayrshire Council currently has three real time continuous monitors to monitor for PM₁₀. Tapered element oscillated microbalance analysers (TEOM) are currently located at Tarbolton Primary School and Prestwick Academy. The former was chosen as a result of the relatively high coal burning appliances in that village, the latter due to its close proximity to Prestwick International Airport. An OSIRIS monitor is located in Sandgate, Ayr. That location was selected as a result of the high traffic flows and street canyon effect likely to be present at that location. It is our intention to carry out monitoring within Maybole High Street due to a similar street canyon effect being likely at that location.

The Council has, in addition, undertaken two three-month PM₁₀ monitoring programmes, one in 2000 and one in 2002. Monitoring was undertaken using gravimetric techniques at four sites around South Ayrshire. The monitoring site inlets were within the town centres at the building facade of Council buildings at first floor level.

Technical guidance LAQM.TG(03) (Reference 2) provides a methodology to factor short- term monitoring results for assessment against annual mean objectives using nearby monitoring sites. The closest national network monitoring site is the Glasgow Centre site.

The Glasgow Centre monitoring site utilises the Tapered Element Oscillating Microbalance (TEOM) automatic analyser. Technical guidance LAQM.TG(03) (Reference 2) states that TEOM analysers may under-read PM₁₀ concentrations in comparison to gravimetric sampling methods. The TEOM concentrations have therefore been factored by 1.3 and presented in table 18.

Table 18 PM₁₀ Concentrations at Monitoring Sites within South Ayrshire

	Tarbolton PS Dec 2005 – April 2006	Prestwick Academy Dec 2005 – April 2006	Sandgate, Ayr March 2005 – March 2006
No.Of Exceedences of 24 Hour Mean (50µg/m ³)	0	0	0
Annual Mean (µg/m ³) corrected (*1.3)	19	17	20

Only 5 months monitoring was available for Tarbolton and Prestwick and since there were no nearby samplers, it is not possible to estimate the long- term mean. It is our intention to continue monitoring at these locations and report more fully in next years progress report. The monitoring results therefore indicate it is unlikely that there will be an exceedence of NAQS objectives for PM₁₀ in 2004 within South Ayrshire. However Sandgate Ayr is currently at the limit for 2010 compliance. We will continue to monitor PM₁₀ concentration at this site but it may

reduce due to improved vehicle technology. Box 8.7 in LAQM TG(03) lists correction factors to estimate secondary PM₁₀ and primary combustion PM₁₀ in future years. Since the majority of the PM₁₀ is assumed to be primary combustion, that correction factor has been used. The figure for 2005 is 0.907 and that for 2010 is 0.815 therefore the projected figure for Sandgate in 2010 is $20 \times (0.795/0.909)$ which equals $17.5 \mu\text{g}/\text{m}^3$.

Any exceedence of the 2004 NAQS objective for PM₁₀ would therefore be as a result of a pollution hotspot. The emissions sources that could cause pollution hot spots are considered in the following Sections.

8.3 Road Traffic

In the first round stage 1 Review and Assessment report (Reference 5) consideration was made to emissions from roads in South Ayrshire. Assessment was made using the nomograms contained in Technical Guidance document LAQM.TG(00) (Reference 8) and the model laid out in the Design Manual for Roads and Bridges (DMRB) (Reference 9). No roads were predicted to have emissions likely to cause an exceedence of air quality objectives for PM₁₀.

A revised version of DMRB was utilised in the second round U and SA report in 2003 this provided a more conservative assessment of road traffic emissions. The DMRB model was obtained from The National UK Air Quality Information Archive (Reference 10). Whilst the DMRB model has been found to significantly underestimate NO₂ and CO concentrations in street canyons there is no evidence of an underestimation of PM₁₀ concentrations in street canyons therefore no adjustment was required.

The results of the DMRB assessments therefore indicated that the PM₁₀ concentration was unlikely to exceed NAQS objectives for PM₁₀ in 2004 but is likely to exceed the annual mean objective level for 2010 at Maybole, Coylton, and Sandgate, Ayr.

It is intended to carry out monitoring at these locations and it is anticipated that this will be reviewed at the next Updating and Screening Assessment in 2009.

8.4 Industrial Sources

During the first round of Review and Assessment no industrial processes were identified as having emissions with potential to cause an exceedence of the NAQS objective for PM₁₀. SEPA agreed with this conclusion in its response to the Stage 1 Review and Assessment of air quality in South Ayrshire.

Consultation with neighbouring local authorities, with SEPA (References 10 and 11) and reference to the public register at the SEPA offices in East did not identify any new industrial processes or existing processes with significantly changed emissions of PM₁₀ that had potential to cause an exceedence of the NAQS objective.

It is therefore concluded that it is unlikely that there will be any exceedence of the NAQS objective for PM₁₀ in South Ayrshire as a result of emissions from industrial processors.

8.5 Solid Fuel Burning

Technical guidance LAQM.TG(03) (Reference 4) indicates that local exceedences of PM₁₀ 24-hour mean objective may occur in areas of concentrated coal burning.

Using Figure 8.8 in technical guidance LAQM.TG(03) (Reference 4), South Ayrshire, with a background PM₁₀ concentration of $21 \mu\text{g}/\text{m}^3$, would require a density of over 200 coal burning

premises within a 500m by 500m area to give rise to an exceedance of the 24-hour mean PM₁₀ objective in 2004.

Figure 8.9 in technical guidance LAQM.TG(03) (Reference 4), estimates that South Ayrshire, with a background PM₁₀ concentration of 15 µg/m³ in 2010, would require a density in excess of 80 coal burning premises within a 500m by 500m area to give rise to an exceedance of the annual mean PM₁₀ objective in 2010.

Information provided by South Ayrshire Council suggests that there are no areas of concentrated coal burning. The villages of Tarbolton, Mossblown, Annbank and Dailly were identified as having more than 50 properties capable of burning coal. However, the area of each of these villages is greater than 0.25 km². From the information available, the number of coal burning properties therefore does not exceed 80 houses per 0.25 km². A detailed assessment was carried out in 2004 for Dailly village (Reference 7) as it was shown to have the highest incidence of coal burning appliances within South Ayrshire. A continuous TEOM PM₁₀ monitor was utilised for this purpose. The findings of the subsequent report were that there was no exceedance of the NAQ objective standard. This was accepted by both SEPA and the Scottish Executive.

It is therefore considered unlikely that there will be any exceedance of NAQS objectives for PM₁₀ as a result of emissions from domestic coal burning.

8.6 Quarries and Dust Emitting Processes

Emissions from quarries and dust emitting processes are difficult to approximate, as they are fugitive and cannot easily be measured. An inventory of quarries and dust emitting processes predicted to be in operation in 2004 and 2010 was undertaken. The processes identified are presented in Table 19 and shown on Figure 3 in Appendix 2.

Table 19 Quarries and Dust Generating Processes within South Ayrshire

Process Location	Distance to Nearest Receptor
Tormitchell Quarry Barr	130m
Craigie Quarry Kilmarnock	180m
Hillhouse Quarry Troon	< 200m

Technical guidance indicates that where receptors exist within a distance of between 200m and 1 km from the source a detailed assessment may be required where the background PM₁₀ concentration for 2004 is greater than µg/m³. As the 2004 background concentration for South Ayrshire was established to be between 18-21 µg/m³ there is no further need for consideration.

The predicted annual mean background concentration for 2010 is below 15 µg/m³. For compliance with the 2010 objectives further investigation is required where the predicted background concentration is less than µg/m³ and there are receptors within 200 metres from source. South Ayrshire Council informed that in addition to the quarries listed in Table 21 there are two land fill sites in operation at Tarbolton Loch and Straid Lendlafoot. Although both landfills are capable of generating dust neither has a receptor within 200m. At Tormitchell quarry there is one property at 130m, at Craigie quarry there is one property at 180m and at Hillhouse quarry there are 10 properties within 200m therefore there is potential for exceedance of the NAQS objectives for 2010.

However, South Ayrshire Council has received no complaints with regards to particles at any of the aforementioned quarries and landfill sites therefore no further assessment will be required.

It is therefore unlikely that there will be any exceedence of 2004 NAQS objectives for PM₁₀ as a result of fugitive releases from quarries and other dusty processes. Further investigation will be required to assess compliance with 2010 NAQS objectives for PM₁₀. It is anticipated that this will be reviewed at the next Updating Screening and Assessment in 2006.

8.7 Air Traffic

Technical guidance LAQM.TG(03) (Reference 4) states that aircraft generated emissions of PM₁₀ from airports with a throughput in excess of 10 million passengers equivalent per annum (mppa) in 2004 and 5 mppa in 2010 may give rise to an exceedence of NAQS annual mean objectives for PM₁₀.

In 2005 Glasgow Prestwick International Airport had a passenger throughput of 2,388,537 passengers per annum (mppa) and an annual freight throughput of 29,675 tonnes per annum. Technical guidance LAQM.TG(03) (Reference 4) states that 100,000 tonnes freight per annum is the equivalent of 1 mppa. The passenger equivalent of freight throughput at Glasgow Prestwick International Airport is therefore 0.3 mppa. The total equivalent passenger throughput at Glasgow Prestwick International Airport in 2000 was therefore 2.7 mppa. Aircraft generated emissions from Glasgow Prestwick International Airport are therefore considered unlikely to exceed the NAQS objectives for PM₁₀. No further assessment of aircraft generated emissions is therefore required. .

8.8 Conclusion

Monitoring of PM₁₀ undertaken within South Ayrshire and at the Glasgow Centre national network monitoring site indicates that the NAQS objectives for PM₁₀ are unlikely to be exceeded in urban locations. It is therefore concluded that ambient PM₁₀ concentrations are unlikely to exceed NAQS objective levels.

No emissions sources were identified that are considered likely to cause a localised exceedence of the NAQS objective for PM₁₀ in 2004, and the annual mean objective set by the Scottish Executive for 2010 should be met at Sandgate Ayr but may be exceeded at Maybole and Coylton for road traffic and in the vicinity of Craigie, Tormitchell and Hillhouse quarries. It is anticipated that these potential exceedences will be reviewed at the next Updating and Screening Assessment in 2009.

It is considered unlikely that there will be any exceedence of the 2004 NAQS objective for PM₁₀ but further assessment will be required in forthcoming years with regard to the 2010 objectives.

A Detailed Assessment for PM₁₀ is not required for South Ayrshire Council.

CONCLUSIONS

Assessment was made of the seven pollutants contained within the National Air Quality Strategy and the ambient ground level concentrations of each pollutant assessed against the NAQS objectives for each pollutant. The conclusions of the assessment were as follows:

The ambient CO concentration is unlikely to exceed the NAQS objective by the end of 2003. No pollutant hotspots from industrial or road traffic emissions sources were predicted. It is therefore concluded that there will be no exceedence of the NAQS objective for CO within South Ayrshire and it is deemed unnecessary to progress to a Detailed Assessment.

No pollutant hotspots from industrial, road traffic or petrol station emissions sources were predicted. Monitoring of benzene undertaken throughout South Ayrshire indicates that the NAQS 2010 objective for benzene is unlikely to be exceeded.

No emissions sources of benzene were identified that are considered likely to cause any other localised exceedence of the NAQS objectives for benzene. Therefore no detailed assessment is required.

The ambient 1,3-butadiene concentration is unlikely to exceed the NAQS objective by the end of 2003. No pollutant hotspots from industrial sources were predicted. It is therefore concluded that there will be no exceedence of the NAQS objective for 1,3 butadiene within South Ayrshire and it is deemed unnecessary to progress to a Detailed Assessment.

The ambient lead concentration is unlikely to exceed the NAQS objective by the end of 2004 or 2008. No pollutant hotspots from industrial emissions sources were predicted. It is therefore concluded that there will be no exceedence of the NAQS objective for lead within South Ayrshire and it is deemed unnecessary to progress to a Detailed Assessment.

The ambient NO₂ concentration is unlikely to exceed the NAQS objectives by the end of 2005. An assessment of emissions from road traffic identified no potential for an exceedence of NAQS objectives in 2005. No other pollutant hotspots were identified therefore it is deemed unnecessary to progress to a Detailed Assessment.

The ambient SO₂ concentration is unlikely to exceed the respective NAQS objectives by the end of 2004 or 2005. No localised pollution hot-spots as a result of emissions from industrial processors or domestic coal burning were identified. It is therefore considered unnecessary to progress to a detailed assessment for SO₂.

The ambient particle concentration is unlikely to exceed NAQS objectives by the end of 2004. No pollutant hotspots from industrial, road traffic or any other emission sources have been predicted. Further assessment will however be required in forthcoming years with regard to the 2010 particle objectives. It is therefore concluded that there will be no exceedence of the 2004 particle objectives and that it is considered unnecessary to progress to a Detailed Assessment.

It will therefore be necessary for South Ayrshire Council to complete a progress report for all pollutants to be submitted to the Scottish Executive by April 2007.

REFERENCES

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- 2 Air Quality (Scotland) Regulations 2000, April 2000
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- 7 Detailed Assessment PM10 in Dailly Village South Ayrshire, April 2004
- 8 Progress Report South Ayrshire, April 2005
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www.airquality.co.uk/archive/laqm/tools/php
- 10 Neighbouring Local Authorities Correspondence
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- 15 National Air Quality Information Archive
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APPENDIX 1 Correspondence

APPENDIX 2 Figures

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