FERMANAGH DISTRICT COUNCIL

Second/Third Stage Review and Assessment of Local Air Quality

September 2004

EXECUTIVE SUMMARY

This report covers the Second and Third Stages of Review and Assessment of local air quality within Fermanagh District Council.

The First Stage Report was completed in August 2001 and concluded that Second/Third Stage Review and Assessment was required for the 3 pollutants: nitrogen dioxide (NO_2) sulphur dioxide (SO_2), and particulate matter (PM_{10}).

The Second Stage assessment was carried out for nitrogen dioxide (NO_2), focusing on relevant locations affected by road traffic at 3 road sections/junctions. This was based upon application of the Design Manual for Roads and Bridges (DMRB) model and diffusion tube monitoring data. The results of both diffusion tube monitoring and the revised DMRB modelling show that it is unlikely that either the annual mean or hourly NO2 objective will be exceeded at relevant receptor locations. The second stage assessment was also carried out for particulate matter (PM_{10}) from traffic sources at these 3 road sections/ junctions using the DMRB model. This modelling predicted no exceedances of the PM_{10} objective from traffic sources.

A number of sources of fugitive emissions of particulate matter (PM_{10}) were reviewed at Stage 2. Based on recent findings in GB and monitoring carried out by a neighbouring Council it was considered that it was not necessary to proceed to a Stage 3 assessment in respect of these sources.

In the absence of any reliable monitoring data Fermanagh DC was required to proceed directly to a Third Stage assessment for sulphur dioxide (SO_2) and particulate matter (PM_{10}) from domestic fuel consumption in a 1km x 1km grid square identified in Stage 1. This involved detailed modelling of domestic fuel emissions using the ADMS model version 3.1. A Fuel Use Survey was carried out to provide estimates of PM_{10} and SO_2 emissions required for the modelling. This modelling suggests that it is unlikely that there will be an exceedance of the SO_2 or PM_{10} objectives in the modelled area. The first round of Review and Assessment indicates that there is no requirement to declare an Air Quality Management Area within the Fermanagh District Council area.

C O N T E N T S

5.0 THIRD STAGE REVIEW & ASSESSMENT

APPENDICIES

1.0 INTRODUCTION TO THE AIR QUALITY REVIEW

1.1 The National Air Quality Strategy

In 1997 the UK Government, fulfilling the requirements of the Environment Act 1995, published its National Air Quality Strategy. This described its plans to improve and protect ambient air quality in the UK in the medium term and identified the roles of those who have a part to play in achieving them. It proposed new air quality standards for:

- Benzene
- 1,3-Butadiene
- Carbon Monoxide
- Lead
- Nitrogen Dioxide
- Ozone
- Particles (PM_{10})
- Sulphur Dioxide

following recommendations from the Expert Panel on Air Quality Standards (EPAQS) and objectives for each of these 8 pollutants.

Following a review of the National Strategy the Air Quality Strategy for England, Wales, Scotland and Northern Ireland (NI) was published in January 2000. In February 2003 an Addendum to the Strategy brought the objectives for carbon monoxide and benzene into line with the limits set by the second Daughter Directive (2000/69/EC) as well as setting further PM_{10} objectives for 2010. The Air Quality Regulations (NI) 2003 prescribe the air quality objectives for NI as set out in the above documents (see Appendix 1). (Ozone was not covered in these Regulations because due to the nature of ozone pollution, action at local level would not be effective in tackling high concentrations).

1.2 Local Air Quality Management

The Environment (NI) Order 2002 (Part III) together with the Air Quality Regulations (NI) 2003 provides the statutory basis for district councils to undertake local air quality management (LAQM) duties in NI. One of the first steps in the LAQM process is for all District Councils to carry out a review and assessment of their local air quality. Despite the fact that these duties only became a legal requirement during 2003, this council along with the majority of district councils in NI commenced the process of assessing local air quality on a voluntary basis during 2000, following commitments given to the Environment & Heritage Service of DoE.

In line with guidance issued by the DETR, that reviews and assessments followed a three stage phased approach, all district councils were required to undertake the first stage and to proceed to subsequent stages if necessary.

Stage One

An initial screening of industrial, transport and any other sources of pollution that could have a significant impact within the council area, resulting in the likelihood of exceedances of the air quality objectives and the potential for human exposure over the specified averaging period for the pollutant.

Stage Two

A more detailed assessment of all the pollutants identified as significant locally in the first stage.

Stage Three

An accurate detailed review of pollutants using computer-modelling and monitoring techniques to predict the likelihood of exceeding the objectives and determine the nature and size of any areas involved where second stage assessment has indicated that air quality objectives will not be achieved by the relevant target dates.

1.3 Position at Completion of Stage One Review & Assessment

The Stage One report for Fermanagh District Council was completed in August 2001. It concluded that no further investigation or action needed to be undertaken for the following pollutants:

- Benzene
- 1,3-Butadiene
- Lead
- Carbon Monoxide

However, the Stage One screening indicated that air quality objectives were at risk of being exceeded for three of the strategy pollutants, namely:

- Nitrogen Dioxide
- Sulphur Dioxide
- Particulate Matter (PM_{10})

Accordingly, Fermanagh District Council was required to proceed to a Stage Two/Three Review of these pollutants.

This report covers the Second and Third Stages of Review and Assessment of local air quality within Fermanagh District Council.

2.0 SECOND STAGE REVIEW & ASSESSMENT

2.1 The Second Stage Review & Assessment Process

The Second Stage Review and Assessment has been carried out using the guidance LAQM. TG4(00) issued by the DETR. Whenever possible reference was also made to the revised technical guidance issued in 2003 (LAQM. TG(03)).

It should be noted that the aim of the Second Stage Review and Assessment is to provide additional screening of pollutant concentrations in the area using simple screening and monitoring techniques. It is not intended to provide an accurate prediction of current and future air quality across the whole of the District Council area. The Second Stage should focus upon those locations where the maximum impact is expected to occur, bearing in mind the potential for public exposure. If the Second Stage indicates that there is a risk that the air quality objective may not be met by the relevant future year then a more detailed and accurate Third Stage Review and Assessment will need to be undertaken.

2.2 Second Stage Review and Assessment of Nitrogen Dioxide (NO_2)

The national air quality objectives for NO_2 are:

- An annual average concentration of 40 $\mu g\ m^{-3}$ (21 ppb); to be achieved 31st December 2005
- 200 $\mu g\ m^{-3}$ (105 ppb) as an hourly average with a maximum of 18 exceedances in a year to be achieved 31st December 2005

Modelling studies suggest that in general achieving the annual mean of 40 $\mu g\ m^{-3}$ is more demanding than achieving the hourly objective. If the annual mean is achieved, the hourly objective will also be achieved.

2.3 Sources identified from First Stage Review and Assessment

Consideration was given at Stage I to existing and proposed emission sources which have the potential, singly or together, to emit significant quantities of NO_2, which are expected to be in operation by 2005 and for which there is the potential for exposure of individuals in relevant locations.

A number of relevant locations within the Fermanagh District Council area which are within 30m of significant traffic sources were screened using the nomograms included in the technical/guidance LAQM. TG4(00). No areas with the potential to exceed the 2005 objective were identified by this screening.

There were however a number of roads or portions thereof in Enniskillen with sensitive properties within 2m of the kerbside and average vehicle speeds less than 20km/hr (12.5mph) where the technical guidance recommends that authorities proceed to a Second/Third Stage review and assessment.

These road sections/junctions were:

- Castle Bridge / Henry Street / The Brook junction
- Anne Street / Queen Street junction
- Belmore Street / Forthill Street / Dublin Road / throughpass junction

It was also considered possible that further road traffic survey work being undertaken by the DoE might identify additional road/section junctions requiring Second/Third Stage assessment.

No other sources other than road traffic were considered to have the potential either singly or together of breaching the objectives for NO_2 following the Stage One review and assessment.

2.4 Screening Methods used in Second Stage Review and Assessment

The Second Stage Review and Assessment was largely based upon the application of the Design Manual for Roads and Bridges (DMRB) and some diffusion tube monitoring data that was available.

2.4.1 Diffusion Tube Data

Monthly average concentrations of NO_2 were measured at 4 sites in Fermanagh DC since April 2000. The results for 2001 are summarised in the following table and can be compared with the annual mean objective. The monthly average data is presented in Appendix II.

Analysis of the tubes was carried out by Ruddock and Sherratt who at that time participated in the laboratory intercomparison exercises for the National NO_2 Diffusion Tube Network.

This laboratory was found to have negative bias of 46.5% in 2001 relative to an automatic analyser. The projections are then made from 2001 to 2005 using correction factors as advised in the Pollutant Specific Guidance.

Table 2.1: Annual average concentrations measured at locations in the Fermanagh District Council area in 2001

Site Name	Site Type	Average NO_2 μgm^{-3} uncorrected for bias	Average NO_2 μgm^{-3} corrected for bias	Prediction in 2005
1	I	7.5	11.0	10
2	K	19.8	29.0	26.3
3	B	4.3	6.4	5.8
4	B	5.1	7.4	6.7

K =Kerbside 1-5m from a busy road

I = Intermediate 5 - 30m from a busy road

B = Background in a residential area more than 50 metres from a busy road.

None of the diffusion tubes placed at background and kerbside locations exceeded the annual mean standard for NO_2 40μ/m^3. Based on this monitoring it was also predicted that none of the locations would exceed the objective in 2005.

One of the above monitoring sites was located at a road section/ junction identified at Stage One as needing further consideration in a Stage Two assessment (Site No. 2 on the corner of Belmore Street).

2.4.2 Modelling Studies

The annual mean concentration of NO_2 for 2005 at the 3 road sections/junctions identified in Stage I were estimated using the Design Manual for Roads and Bridges (DMRB). This work was undertaken by Netcen on behalf of Fermanagh DC during the spring of 2002 [Air Quality Review and Assessment – Stage II – A report produced for Fermanagh DC May 2002]. No additional road sections/junctions requiring Stage 2/3 assessment were identified by further road surveys undertaken by DOE Roads Service.

Traffic flow data and distances from the receptor to the centre of the road and from the receptor to the kerb for the 3 road sections/junctions were provided by Fermanagh DC. Concentrations were assessed at traffic speeds of 32kph in order to be representative of traffic congestion at junctions.

The model used to predict the concentrations required estimates of the percentage of HGVs on the roads. A figure of 6.7% was provided by DoE Roads Service.

Table 2.2 lists the annual average and 99.8th percentile of maximum hourly average kerbside concentrations (equivalent to 18 exceedances per year) of nitrogen dioxide predicted for 2005 in the Fermanagh District Council area. Following advice given in LAQM. TG4(00), the 99.8th percentile of hourly averages has been estimated as 3.5 times the annual mean for roadside locations. For 2005, annual average concentrations of nitrogen dioxide are predicted to be

near or over 40 μg m^{-3} at the three road junctions modelled. At all locations the hourly objective was predicted to be met.

Table 2.2: Nitrogen dioxide concentrations at roadside locations in Fermanagh District Council

Description of Link	Distance to nearest receptor from kerbside (m)	NO_2 Annual mean (μg m^{-3}) 2005	NO_2 99.8th percentile of hourly averages (μg m^{-3}) 2005
Henry St / The Brook / West Bridge / Castle Bridge	3.75	39.2	137.2
Anne St / Queen St / Darling St / Castle St	1.25	41.6	145.6
Belmore St / Forthill St /Dublin Rd/Fairview Av/Throughpass	3.75	38.1	133.4

The distance to the nearest receptor from the kerbside shown above is the nearest residential accommodation to any of the road links.

The diffusion tubes exposed at Site 2 (on the corner of Belmore Street) gave an annual average concentration of 29 μg/m^3 corrected for bias in 2001. Using factors from the PSG, this gives an estimated concentration in 2005 of 26.3 μg/m^3. This is well below that predicted by DMRB at this location (38.1 μg/m^3). Netcen therefore suggested that monitoring at this site be continued and that additional monitoring be placed at the other two identified sites above.

2.4.3 Re-modelling Studies

The concentration of NO_2 was re-assessed at the 3 road sections/junctions in January 2004 using the revised DMRB model. This had been updated since Fermanagh's Stage Two Review and Assessment was initially undertaken and

includes a revised set of vehicle emission factors, improved roadside dispersion curves and a new relationship to estimate NO_2 from NOx.

Annual mean NO_2 concentrations were predicted at the nearest relevant receptors at each road junction. Again a figure of 6.7% was used for the proportion of heavy-duty vehicles on the road but a slow traffic speed of 20km/hr was modelled, as a conservative estimate, as well as a faster speed of 30km/hr. Estimated background concentrations were taken from the NAEI website (www.naei.org.uk) as recommended in Technical Guidance (TG(02)). Table 2.3 below shows the results of the updated DMRB model run.

Table 2.3: Updated estimated annual mean NO_2 concentrations at the nearest relevant receptors in 2004 & 2005 ($\mu g/m^3$) at 20kph and 30kph

Junction	Average speed (kph)	NO_2 Annual mean (μg m-3) 2005
Belmore Street/ Throughpass	20	22.3
	30	20.7
Henry Street/ The Brook	20	22.6
	30	21
Anne Street/Queen Street/Darling Street/Castle Street	20	23.9
	30	22.2

The DMRB modelling results show that there is no predicted exceedance of the NO_2 objective.

2.4.4 Further NO_2 Diffusion Tube Results

NO_2 concentrations continued to be measured by diffusion tubes at the corner of Belmore Street and diffusion tube monitoring commencing at the other two road sections/junctions in May 2002. The diffusion tubes were analysed by Ruddock &

Sherratt. The results for 2003 are summarised in the following table and can be compared with the annual mean objective. The monthly average data is presented in Appendix 3.

Unfortunately there was no bias correction data available for this period as there was no co-location with a continuous monitor taking place, and the laboratory was unable to provide any data. A conservative bias adjustment factor of 1.25 as suggested by experts within Netcen's was therefore used. The bias corrected results predicted forward to 2005 using factors provided in Technical Guidance (TG(03)) are as set out in the table below.

Table 2.4: Nitrogen dioxide concentrations as recorded by diffusion tubes between January and December 2003 ($\mu g/m^3$)

Location	Uncorrected for bias	Bias corrected	Prediction in 2005
Belmore Street	21.4	26.8	25.4
Anne Street	22.3	27.9	26.4
Henry Street	29	36.2	34.3

2.5 Conclusion for NO_2

The results of both the diffusion tube survey and the revised DMRB model runs show that it is unlikely that either the annual mean or hourly NO_2 objective will be exceeded in Fermanagh DC area at relevant receptor locations.

Fermanagh District Council will not therefore need to undertake a Third Stage Review and Assessment for NO_2.

3.0 SECOND STAGE REVIEW & ASSESSMENT OF SULPHUR DIOXIDE (SO_2)

3.1 Standards and Objectives for SO_2

There are three national air quality objectives for SO_2:

- 266μg m^{-3} as a 15 minute mean (maximum of 35 exceedances a year or equivalent to the 99.9th percentile) to be achieved by the 31st December 2005
- 350μg m^{-3} as a 1 hour mean (maximum of 24 exceedances a year or equivalent to the 99.7th percentile) to be achieved by the 31st December 2004
- 125μg m^{-3} as a 24 hour mean (maximum of 3 exceedances a year or equivalent to the 99th percentile) to be achieved by the 31st December 2004

The 15 minute objective is the most stringent; the other two objectives will not be exceeded if this objective is not exceeded.

3.2 Sources identified from First Stage Review and Assessment

Consideration was given at Stage One to existing and proposed emission sources which have the potential, singly or together, to emit significant quantities of SO_2, which are expected to be in operation by 2004/05 and for which there is the potential for exposure of individuals in relevant locations.

A number of industrial sources, both within the district council area and in Co Cavan, were screened using the Stage One methodology and found not to be at risk of exceeding the SO_2 objective. No combustion plants greater than 5MW or planned developments which would be a significant source of SO_2 were identified.

The Pollutant Specific Guidance LAQM. TG4(00) advises that the risk of exceedance of the 2005 SO_2 objective can be considered significant where the density of coal-burning (including solid smokeless fuel) houses exceeds 300

properties per 1km x 1km grid square. A fuel-use survey on one 1km x 1km square, which corresponds with the most densely populated area of Enniskillen, indicated more than 300 such properties and hence a Stage 2/3 Review and Assessment was required. It was considered highly unlikely that any other residential area within the district would require a similar assessment.

3.3 Screening methods used in Second Stage Review and Assessment

The Pollutant Specific Guidance LAQM. TG4(00) advises that the Second stage Review and Assessment for SO_2 from domestic sources is likely to rely upon a review of monitoring data within the local area. If existing concentrations exceed the air quality objectives the authorities should proceed to a Third stage Review and Assessment. In the absence of any monitoring data the authority will need to proceed to a Third Stage Review and Assessment.

Monitoring of SO_2 using diffusion tubes has been undertaken by Fermanagh DC at two urban residential locations in Enniskillen since April 2000.

- Site 1 – Everglades, Tempo Road, Enniskillen
- Site 2 – Rossole Park, Enniskillen

Results for these sites are summarised in Table 3.1 below.

Table 3.1: Annual Mean Results for SO_2 Diffusion Tubes ($\mu g/m^3$)

	Site 1 (background)	**Site 2 (background)**
2000 (April)	2.4	3.7
2001	2.1	3.4
2002	1.9	1.9
2003	3.2	3.2

Diffusion tubes for SO_2 cannot however be relied upon to give reliable quantitative results.

3.4 Second Stage Conclusion for SO_2

In the absence of any reliable monitoring, Fermanagh DC was required to proceed directly to a Third Stage Review and Assessment in respect of SO_2 from domestic fuel combustion for the 1km x 1km grid square identified in Stage 1.

SECOND STAGE REVIEW AND ASSESSMENT OF PARTICULATES (PM_{10})

4.1 Standards and Objectives for PM_{10}

There are two air quality objectives prescribed for PM_{10} which are equivalent to the EU Stage One limit values in the first Air Quality Daughter Directive. The (gravimetric) objectives, both to be achieved by 31 December 2004, are:

- An annual mean of 40µg/m^3
- A 24 hour mean of 50µg/m^3 not to be exceeded more than 35 days per year.

The EU has also set indicative limit values for PM_{10} which are to be achieved by 1 January 2010. These Stage Two limit values are considerably more stringent, and are 20µg/m^3 as the annual mean, and 50 µg/m^3 as the 24-hour mean to be exceeded on no more than 7 days per year. The Government, the Welsh Assembly Government and the Department of the Environment in Northern Ireland introduced provisional objectives to be achieved by the end of 2010, that are broadly in line with the Stage Two limit values, although it is not intended that these objectives will be brought into Regulation for the purpose of Local Air Quality Management at this time. The provisional objectives are:

- For all parts of England (except London), Wales and Northern Ireland, a 24-hour mean of 50µg/m^3 not to be exceeded more than 7 times per year, and an annual mean of 20µg/, to be achieved by the end of 2010.
- For London, a 24-hour mean of 50µg/m^3 not to be exceeded more than 10 times per year, and an annual mean of 23µg/m^3, to be achieved by the end of 2010. An annual mean objective of 20µg/m^3 to be achieved by the end of 2015, has also been set.

The 24 hour objective is more stringent than the annual mean objective in 2004 however the opposite is true in 2010.

4.2 Sources identified from First stage Review and Assessment

Consideration was given at Stage One to existing and proposed emission sources which have the potential, singly or together, to emit significant quantities of PM_{10} and are expected to be in operation in 2004, and for which there is the potential for exposure of individuals in relevant locations.

The Pollutant Specific Guidance LAQM. TG4(00) provides two nomograms which can be used at Stage One to determine possible exceedances of the PM_{10} objective on roads with greater than 5,000 vehicles per day. Using this screening method no free flowing roads were identified in the Fermanagh District Council area which would have the potential to exceed the 2004 objective.

The nomograms were not, however, appropriate where daily traffic speeds are less than 20km/hr (12.5mph) on single carriageway roads or less than 65km/hr (40mph) on dual carriageways and also where properties are closer than 2m of the kerbside of single carriageways or 10m of the kerbside of dual carriageways. Consequently a number of road sections/junctions automatically required a Stage 2/3 Review and Assessment:

- Castle Bridge/Henry Street/The Brook Junction
- Anne Street/Queen Street Junction
- Belmore Street/Forthill Street/Dublin Road/through pass junction

There was also the possibility that road traffic survey work being undertaken by DOE Roads Service would identify additional roads/junctions which would require a stage 2/3 assessment.

In relation to domestic solid fuel use the Pollutant Specific Guidance LAQM. T4(00) advises that the risk of exceedance of the 2004 objective within an area may be assessed by calculating the number of people per square kilometre within coal burning households. This should then be compared with nomograms to determine possible exceedances.

A square km which comprises most of the most densely populated parts of Enniskillen town ie Cornagrade, Kilmacormick and Hillview was therefore considered. Application of the First stage screening methodology to this area indicated that there was the potential to exceed the objectives for PM_{10} and a Second/Third stage assessment should be carried out.

It was also considered that there might be some other areas in the district that, although less densely populated, may, if subjected to screening, require a stage 2/3 Review and Assessment. No such areas were subsequently found.

There are a considerable number of industrial sources in Fermanagh District Council which are potential sources of PM_{10} with emissions likely to arise from a variety of uncontrolled or fugitive sources rather than from a stack in the majority of cases. Application of the First stage screening methodology or using the criteria suggested in respect of fugitive emissions indicated some risk of the objectives being exceeded in respect of 9 industrial sources:

- Quinn Group Cement Factory & Quarry, Gortmullan, Derrylin
- Carn Quarry, Ederney
- Quinn Group Roof Tiles and Blocks
- Greenahoe Quarry, Belcoo
- Knockninny Quarry, Derrylin
- Slushhill Quarry, Lisnaskea
- Tracey Concrete, Enniskillen
- Roosky Quarry, Enniskillen
- Quinn Group Quarry, Kinawley

There was also one planned development in Fermanagh District Council area considered to be a potentially significant source of PM_{10}:

- Proposed Landfill Facility at Drumee, Enniskillen

There was also one known potentially significant source of PM_{10} in a neighbouring area which was considered likely to have an impact within the Fermanagh District Council area.

- Quinn Group Cement Factory at Scotchtown, Co Cavan

A Second/Third Stage Review and Assessment was considered necessary for the above two potential industrial sources of PM_{10}.

4.3 Screening Methods used in Second Stage Review and Assessment.

4.3.1 Road Traffic

The second stage review and assessment is based upon the application of modelling. This modelling work was undertaken by Netcen on behalf of Fermanagh District Council during the spring of 2002 [Air quality Review and Assessment – Stage II – A report produced for Fermanagh District Council May 2002].

Traffic flow data and distances from the receptor to the centre of the road and from the receptor to the kerb were provided by Fermanagh District Council. Concentrations were assessed at traffic speeds of 32kph in order to be representative of traffic congestion at junctions. The model used to predict the concentrations required estimation of the percentage HGVs on the roads. A figure of 6.7% was provided by DOE Roads Service.

As recommended in TG4(00), DMRB has been used to predict PM_{10} concentrations for 2004 from road traffic but the background concentrations given within the model have been ignored. The estimated maximum background concentration for 2004 of 17.8$\mu g\ m^{-3}$ for the Fermanagh District Council area has then been added to provide total predicted PM_{10} concentrations. Estimated traffic flows for 2005, (as expected traffic flows in 2004 were not available) as supplied by Fermanagh District Council, were used in these calculations.

Guidance TG4(00) states that the 24-hour objective is highly unlikely to be exceeded if the annual mean concentration is below 28μg m^{-3}, gravimetric.

Tables 4.1 shows the 2004 predictions that may be compared against the objectives. For 2004, the method predicts annual average concentrations of PM_{10} less than 28μg m^{-3} at all of the locations modelled.

Table 4.1: Predicted PM_{10} concentrations at roadside locations in the Fermanagh District Council Area

Description of Link	Distance to nearest receptor from kerbside (m)	PM_{10} Annual mean (μg m^{-3}) 2004
Henry St / The Brook / West Bridge / Castle Bridge	3.75	21.0
Anne St / Queen St / Darling St / Castle St	1.25	21.4
Belmore St / Forthill St /Dublin Rd/ Fairview Ave/ Throughpass	3.75	20.7

The distance to the nearest receptor from the kerbside shown above is the nearest residential accommodation to any of the road links.

The opportunity was taken early in 2004 to reassess the situation using the updated DMRB model. This includes a revised set of vehicle emission factors, improved roadside dispersion curves and a new relationship to estimate NO_2 from NO_x.

A figure of 6.7% was again used for the proportion of heavy duty vehicles on the roads but a slow traffic speed of 20kph was modelled, as a conservative estimate, as well as a faster speed of 30kph. Estimated background concentrations were taken from the NAEI website as recommended in Technical Guidance (TG(03)).

The table below shows the results of the updated DMRB model run (AEA Report by AEAT/ED49225001 Feb 2004).

Table 4.2: Estimated annual mean PM_{10} concentrations in 2004 at 20kph and 30kph

Junction	Average speed (kph)	PM_{10} Annual mean (µg m-3) 2004	PM_{10} number of days exceedance
Belmore Street/ throughpass	20	23.9	10
	30	22.1	7
Henry Street/The Brook	20	24.2	10
	30	22.3	7
Anne Street/Queen Street/ Darling Street/Castle Street	20	25.3	13
	30	23.3	9

These results confirm that there are no predicted exceedances of the PM_{10} objectives from traffic sources.

4.3.2 Domestic Solid Fuel Use

The Pollutant Specific Guidance TG4(00) advises that the assessment of the impact of domestic solid fuel can be carried out from existing black smoke data based on an empirical relationship between the annual mean black smoke measurement and the annual mean secondary PM_{10} concentration. In the absence of any monitoring data, as is the case in Fermanagh District area, the authority will need to proceed to a Third Stage Review and Assessment.

4.3.3 Industrial Sources and Uncontrolled and Fugitive Dust Emissions

The Pollutant Specific Guidance TG4(00) advises that predictions of PM_{10} concentrations arising from controlled industrial sources may be carried out using

the Environment Agency's Guidance for estimating the Air Quality Impact of Stationary Sources (GSS).

Of the eleven potentially significant industrial sources of PM_{10} identified at Stage One, two were controlled sources.

One of these – Quinn Group Cement Factory has since ceased operation. The other – Quinn Group Cement Factory at Scotchtown, Co Cavan has been reassessed. The Environmental Statement accompanying the planning application for this relatively new plant was obtained and it contained pollutant dispersal modelling. This indicated that the PM_{10} objective would not be exceeded at any properties within the Fermanagh District Council area. The emissions from this plant are not believed to have changed significantly since it was first commissioned.

The remaining nine potential sources of PM_{10} identified at Stage One are uncontrolled and consequently potential sources of fugitive emissions ie quarries, material stockyards and a proposed landfill site.

The Pollutant Specific Guidance TG4(00) advised that for uncontrolled emissions there is no suitable screening approach which can be confidently applied to the Second Stage Review and Assessment and authorities may need to proceed to a Third Stage Assessment which will normally involve a detailed monitoring programme.

Fermanagh District Council has reviewed the position regarding the nine potential fugitive emission sources and now holds the view that the majority of dust emissions from such tend to be within the larger particle size fractions, and consequently fall out from the atmosphere rapidly with increasing distance from the source. Monitoring studies completed by authorities in GB have indicated few, if any, exceedances of the objectives in the vicinity of quarrying activities. [The first phase Air Quality Review and Assessment Studies: A summary – Netcen 2000]. This was also borne out by monitoring carried out by a neighbouring Council (Omagh District Council) in the vicinity of a large quarry

over the period February to September 2003. Over this very dry summer period only six exceedances of the 24 hour mean objective level were recorded. It is therefore considered that it is not necessary to proceed to a Stage 3 Review and Assessment in respect of these sources. Nevertheless the opportunity may be taken to undertake monitoring around some of these potential sources in the future.

4.4 Second Stage Conclusion for PM_{10}

Modelling indicates that there are no predicted exceedances of the PM_{10} objective from traffic sources and hence no need to proceed to a Third Stage Review and Assessment.

In relation to domestic solid fuel use Fermanagh District Council will, in the absence of any monitoring data, need to proceed to a Third Stage Review and Assessment.

Based on findings elsewhere Fermanagh District Council do not consider that it is necessary to proceed to a Stage Three Review and Assessment in respect of industrial type sources, controlled or uncontrolled.

5.0 THIRD STAGE REVIEW & ASSESSMENT

5.1 The Third Stage Review & Assessment Process

The Third Stage review and assessment has been carried out using the guidance LAQM. TG4 (00) issued by DETR. Whenever possible reference was also made to the revised technical guidance issued in 2003 (LAQM. TG (03)).

This stage involves a detailed and accurate appraisal of the impacts and requires that the assumptions within the review and assessment process are considered in depth and any data which is collected or used is quality assured to a high standard. This is to ensure that there is confidence in the decisions reached at the conclusion of Stage 3.

The Third Stage also requires that authorities determine both the magnitude and geographical extent of the likelihood of any exceedances of the objective.

5.2 The Third Stage Review and Assessment of Sulphur Dioxide (SO_2) and Particulates (PM_{10})

In the absence of any reliable monitoring for SO_2 or PM_{10} Fermanagh District Council proceeded directly to a 3rd stage review and assessment in respect of SO_2 and PM_{10} from domestic fuel consumption from a 1km x 1km grid square identified in stage 1. This involved detailed modelling of domestic fuel emissions using ADMS version 3.1. This work was undertaken by Netcen on behalf of Fermanagh DC [Air Quality Review and Assessment – Stage 3 Domestic Fuel Combustion Report to Fermanagh District Council, April 2003]. A Fuel Use survey was carried out to provide estimates of PM_{10} and SO_2 emissions required for the modelling.

The following information was used to support this assessment:-

- Hourly sequential meteorological data was obtained for 1999 from the Meteorological Office for the Aldergrove site for input into the ADMS dispersion model
- In the absence of any local monitoring data to validate/verify the modelling it is possible to use monitoring data of a nearby authority. This is the approach taken here. As Fermanagh had no relevant monitoring data, use was made of monitoring data available from Strabane.

5.3 SO_2 Assessment

5.3.1 Monitoring Data

Sulphur dioxide concentrations have been continuously monitored at Springhill Park in Strabane (Ordnance Survey Grid Reference 2351 3972) since April 2002. The site is in a dense domestic fuel burning area. A summary of the concentrations recorded at the site is shown in Table 5.1 below. The data has been ratified by Netcen and conforms to the Defra standards.

Table 5.1 Summary of continuous SO_2 data 26th April 2002 to the 28th January 2003

	SO_2 ($\mu g/m^3$)
Average	8
Maximum daily	29.3
Maximum hourly mean	90.4
99.9^{th} %ile 15 minute mean	74.5
Data capture	93.4%

The most stringent SO_2 objective is the 99.9 percentile 15 minute mean. If this objective is met then it is likely that all the other objectives will be met. The 99.9^{th} % percentile 15 minute mean concentration at the Strabane site is well below the objective of 266 $\mu g/m^3$ for sulphur dioxide during the period of monitoring.

5.3.2 Comparison of Monitoring Data with Belfast East Site

The modelling carried out used 1999 meteorological data from Aldergrove. Therefore a comparison was made between SO_2 concentrations recorded by the

continuous monitor at Belfast East in 1999 with that recorded between 26th April and the 28th January 2003 when the Springhill park site was in operation. Ideally a comparison would have been done with more monitoring sites but Belfast East was the only site for which data was available and for which was deemed suitable. The results are shown in Table 5.2 below.

Table 5.2 Comparison of 99.9 percentile 15 minute mean SO_2 concentrations in Springhill Park with the Belfast east site ($\mu g/m^3$)

Site	1999	2000	2001	26th April 2002 to 28th Jan 2003
Belfast East	338	274	373	162
Springhill Park	*	N/a	N/a	74.5

The Belfast East site recorded far higher 99.9 percentile 15 minute mean SO_2 concentrations in 1999, 2000 and 2001 than during April 2002 to January 2003 when the Springhill site was in operation. Therefore it is likely that although the concentrations recorded by the monitor in Strabane are well below the SO_2 15 minute mean objective, that this period of monitoring is unrepresentative of the norm.

* It is estimated that in 1999, Springhill Park would have recorded a 99.9 percentile 15 minute mean SO_2 concentration of approximately 155 $\mu g/m^3$. This figure has been used to bias correct the modelled results.

5.4 PM_{10} Assessment

5.4.1 Monitoring Data

PM_{10} concentrations have been continuously monitored in Strabane District at Springhill Park since April 2002 (OS Grid Reference 2351, 3972).

A summary of the PM_{10} concentrations recorded by the continuous monitor (gravimetric equivalents) is provided in Table 5.3 below.

QA/QC of continuous monitoring data

The data from the continuous monitor located at Springhill Park has been ratified by Netcen. The data conforms to the QA/QC standards used in the Defra network.

Summary statistics

Table 5.3 shows the daily average measured concentrations from the 26th April 2002 until the 28th January 2003. The average concentration (ratified) for the Springhill site exceeds the annual and 24 hour objective for PM_{10}.

Table 5.3 Summary of continuous PM_{10} ratified data from the 26th April 2002 to the 28th January 2003 inclusively. Concentrations are in gravimetric equivalents.

	Concentration, μg m^{-3}
	PM_{10}
Average over period	43
90 %ile of 24hour mean	73
Data capture	98%

5.4.2 Comparison of Monitoring Data with Derry

The modelling carried out used 1999 meteorological data from Aldergrove. Therefore a comparison was made between PM_{10} concentrations recorded by the continuous monitor in Derry in 1999 with that recorded between 26th April and the 28th January 2003 when the Springhill park site was in operation. Ideally a comparison would have been done with more monitoring sites but Derry was the only site for which data was available and for which was deemed suitable. The results are shown in Table 5.4 below. All results shown are in gravimetric equivalents.

Table 5.4 Comparison of PM_{10} concentrations in Springhill Park with the Derry site.

Site	90^{th} percentile daily mean ($\mu g/m^3$) in 1999	90^{th} percentile daily mean ($\mu g/m^3$) from 26^{th} April 2002 to 28^{th} Jan 2003
Derry	39	37.7
Springhill Park	*	73

* It is estimated that in 1999, Springhill Park would have recorded a 90^{th} percentile daily mean PM_{10} concentration of approximately 75.5 $\mu g/m^3$. This result has been used in the modelling to correct for bias.

5.5 Results of the Fuel Use Survey

5.5.1 Introduction

Domestic fuel combustion releases particulates (including PM_{10}) and SO_2, (from the sulphur in fuel). To estimate emissions of PM_{10} and SO_2, a fuel use survey was required.

The Fuel Use Survey was carried out by WREAN (the Western Regional Energy Agency and Network) on behalf of Fermanagh District Council. The survey covered the Devenish region and determined:

- the types of fuels used in the domestic sector,
- the quantities of fuels consumed,
- the seasonal use of heating fuels,
- the types of heating appliances used,
- the total number of persons who live in coal burning households.

There were 1100 dwellings in the 1 km grid square under review. Of these properties 211 householders, or nearly 20%, completed a fuel usage survey for their property. The main fuel usage was as detailed in table 5.4.

Table 5.5 Fuel survey results for main fuel usage of the 211 dwellings questioned in Devenish

Fuel	Number of properties	% of those questioned
Oil	**135**	**64**
Solid Fuel	**61**	**29**
Economy	**15**	**7**

Based on these results it was assumed that the proportion of main fuel usage is the same in the rest of the 1km grid and therefore the number of properties in the entire grid using each fuel type was estimated.

Table 5.6 Fuel survey results for main fuel usage calculated up for all properties in the1km grid

Fuel	Total estimated number of properties
Oil	**704**
Solid Fuel (coal)	**293**
Solid Fuel (Solid Smokeless Fuel)	**26**
Economy	**77**

The results of the survey showed that overall oil was the most popular fuel in the grid (64% of all households). Solid Fuel accounted for 29% of all households and 7% used Economy 7 (i.e. electrical heating) as the main fuel.

The quantities that each household use were also estimated. The total fuels use has been calculated for the grid from the survey results, see tables 5.6 and 5.7.

Table 5.7 Fuel survey results for oil as main fuel calculated up for all properties in the1km grid

Litres oil	
211365	litres oil used by 135 properties
1566	average litres used per property
1102229	**Total number of litres of oil used in the 1km grid**

Table 5.8 Fuel survey results for Solid fuel as main fuel calculated up for all properties in the1km grid

Solid Fuel	
153	Number of 50 kg bags used by 61 properties
3	average number of 50 kg bags used per property
800	Total number of 50 kg bags used in grid
40006 kgs	**Total weight of solid fuel in grid / yr**

To satisfactorily assess whether there might be exceedances of the objectives, the strength of any emissions (in other words how much coal will be burnt) and when these emissions would occur (in other words, on which days and when during the day) were considered.

The seasonal change in coal use was surveyed and the averages are that the main fuel is used in winter for 10.6 hours but only for 3.7 hours in summer. However to predict when the coal burning is likely to be most intense, an approach called a "degree day" approach was used. The word "degree" relates to the external temperature, measured in degrees. Using this approach, the outside temperature was used to estimate when people may start to burn coal, and, how much coal they might burn in a day based on how cold it is. This approach provides the best estimate of the likely concentrations and any exceedances of the relevant air quality objectives.

5.5.2 Emission factors used in the modelling

The PM_{10} emissions arising from domestic fuel combustion were taken from the UK emission factor database (www.naei.org.uk). This web site is managed by Netcen on behalf of Defra. The emission factor for sulphur dioxide from household coal was taken from a CRE study carried out by Netcen for Belfast City Council. It was felt that this locally derived emission factor may be more representative of fuel burnt in Northern Ireland.

Table 5.9 Emissions arising from domestic fuel combustion

Fuel type	SO2	PM_{10}	Units
Anthracite	13	3.59	kt/mt fuel burnt
Burning Oil	0.42	0.01	kt/mt fuel burnt
Coal	10*	10	kt/mt fuel burnt
SSF	16	5.6	kt/mt fuel burnt
Wood	0.03	7.9	kt/mt fuel burnt

Source: UK emission factor database (www.naei.org.uk)

SSF = solid smokeless fuel

* - emission factor taken from CRE, 1997.

The emission factors provided in the above table were used to derive PM_{10} and SO_2 emissions for the area.

5.5.3 Spatial Emissions Inventory

In the 1 km grid there are 1100 households. The emission factors shown in Table 5.8 above were applied to the results of the fuel survey for the grid square to calculate PM_{10} and SO_2 emissions arising from the area as a result of domestic fuel combustion.

5.6 Detailed modelling

5.6.1 Overview of the modelling approach

The dispersion model ADMS 3.1 was used to predict the PM_{10} and SO_2 concentrations in the Fermanagh district. ADMS is a PC-based model that includes an up-to-date representation of the atmospheric processes that contribute to pollutant dispersion and has been deemed suitable for use in the review and assessment process.

The emissions arising from each survey area have been modelled as a volume source. Emissions have been weighted with both seasonal and diurnal emission patterns. The seasonal emission pattern was obtained from the Building Research Establishment Domestic Energy Model (BREDEM, BRE, 1985). The pattern was derived using formulae that allow a degree day to be calculated. The degree day provides a method to weight emissions to the colder periods of the year. A seasonal profile was derived using the 1999 Aldergrove meteorological data.

5.6.2 Estimated background concentrations

The modelled concentrations were added to estimated background concentrations (taken from the NAEI web site). The maximum background concentrations for the Fermanagh region were used as conservative estimates and therefore the background concentrations that have been used are:

PM_{10}

14.9 $\mu g/m^3$ maximum as an annual average in Fermanagh District Council in 2004 (average 12.6$\mu g/m^3$). Multiplied by 1.68 gives the 90^{th} percentile (as advised in LAQM TG4(00) and therefore a 90^{th} percentile equivalent of 25$\mu g/m^3$.

SO_2

8.3$\mu g/m^3$ as an annual average maximum in the area in 2001 which is therefore predicted to be 75% of that value in 2004/2005. Hence a predicted estimate of 6.2$\mu g/m^3$ in 2004/2005. To be relevant to the 15minute mean this is doubled and therefore the background for 15 minute means is 12.4$\mu g/m^3$.

5.6.3 Model bias

The monitoring site at Springhill Park was used as a reference site: e.g. model concentrations were adjusted by taking the ratio between the modelled concentration at the site and the predicted measured value in 1999. The purpose of this adjustment was to ensure that the modelled concentrations equalled the measured values at the relevant monitoring sites.

The modelling produced an estimate of the concentrations from domestic fuel combustion. This estimate needs to be compared with the concentrations accurately recorded by a continuous monitor. Any difference between the modelled and the monitored concentrations is called the model bias. In this case the model bias was calculated at Springhill Park, Strabane.

5.6.4 Model verification

The calculations have not taken account of:

- uncertainties in the fuel use survey;
- uncertainties in how the burning of domestic fuel might change in future years;
- Uncertainty resulting from year to year variations in atmospheric conditions;
- Model errors at the receptor sites;
- Model errors at the reference site;
- Uncertainty in the location of the monitor with respect to local sources
- Monitoring over a short time period
- Uncertainty in emission factors

Pollutant emissions are expected to decrease generally due to national measures (which will affect the background concentrations). However, for SO_2 in particular the background contribution is small. Concentration plots are therefore only shown for 1999 as this is the year for which modelling has been carried out and it is assumed that the results of the survey are applicable to both 1999 and 2004/5.

5.7 Results of modelling

5.7.1 SO_2

Figure 5.1a shows modelled SO_2 concentrations in the 1 km grid square in Enniskillen in 1999, **uncorrected** for model bias. The model predicts that the 99.9 percentile of the 15 minute mean SO_2 concentration **will not be exceeded** in the grid. The highest concentrations are predicted in the north east area. This is due to a higher concentration of housing in this area.

Figure 5.1b shows modelled SO_2 concentrations in the 1 km grid square in Enniskillen in 1999, **corrected** for model bias using the bias adjustment factors used by Strabane. The model predicts that the 99.9 percentile of the 15 minute mean SO_2 concentration **will not be exceeded** in the grid. The highest concentrations are predicted in the north east area. This is due to a higher concentration of housing in this area.

Due to the uncertainty in the domestic fuel burning in future years and the minute contribution of background SO_2, no attempt has been made at predicting concentrations in 2004/5. In this study, emissions from domestic fuel combustion in 2004/2005 are assumed to remain unchanged over those calculated from the fuel use survey.

Table 5.2 showed the variation in SO_2 concentrations between 1999 and 2002 in Belfast East. This highlighted the fact that the SO_2 concentrations recorded by the continuous monitor in Springhill Park in Strabane between April 2002 and January 2003 might not be representative of 1999, which is the year that the time varying emissions factors have been calculated for.

Fig 5.1(a) A contour plot of SO_2 concentrations predicted by the modelling relevant to the 15 minute mean objective, without a correction for model/monitor bias.

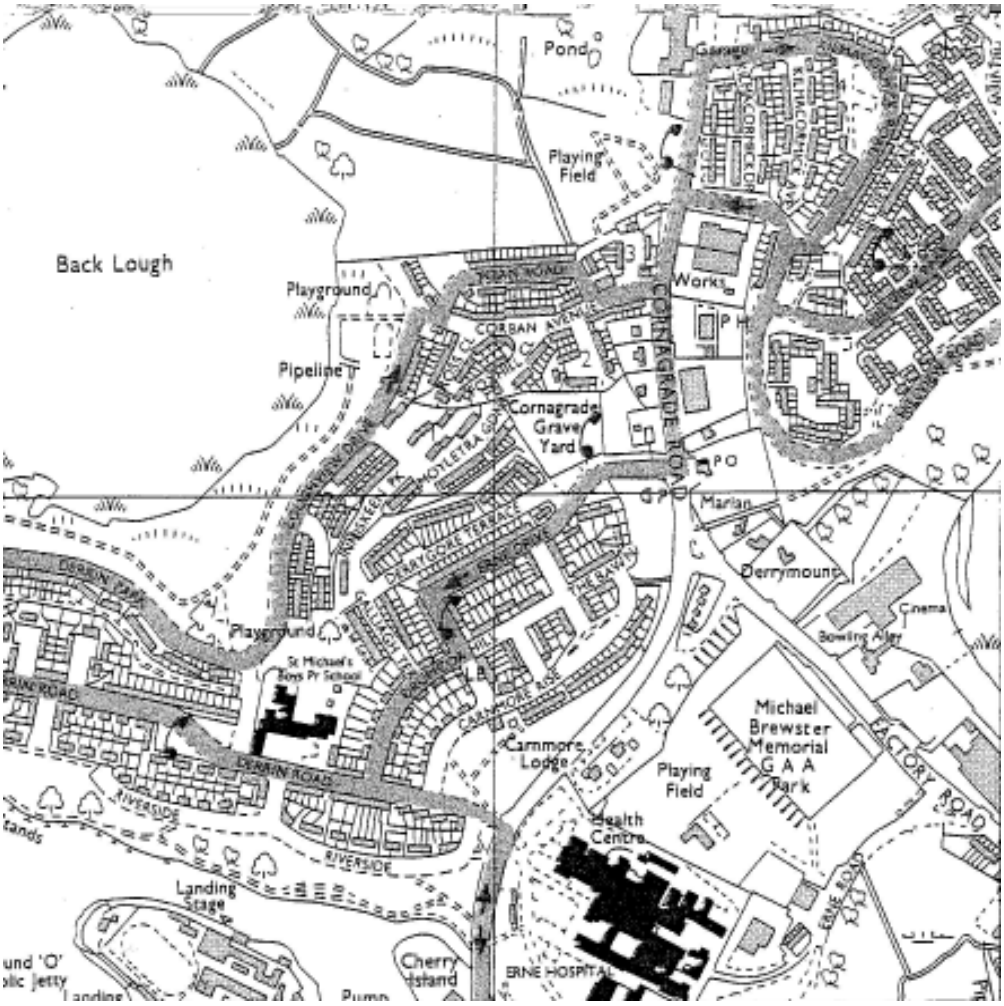
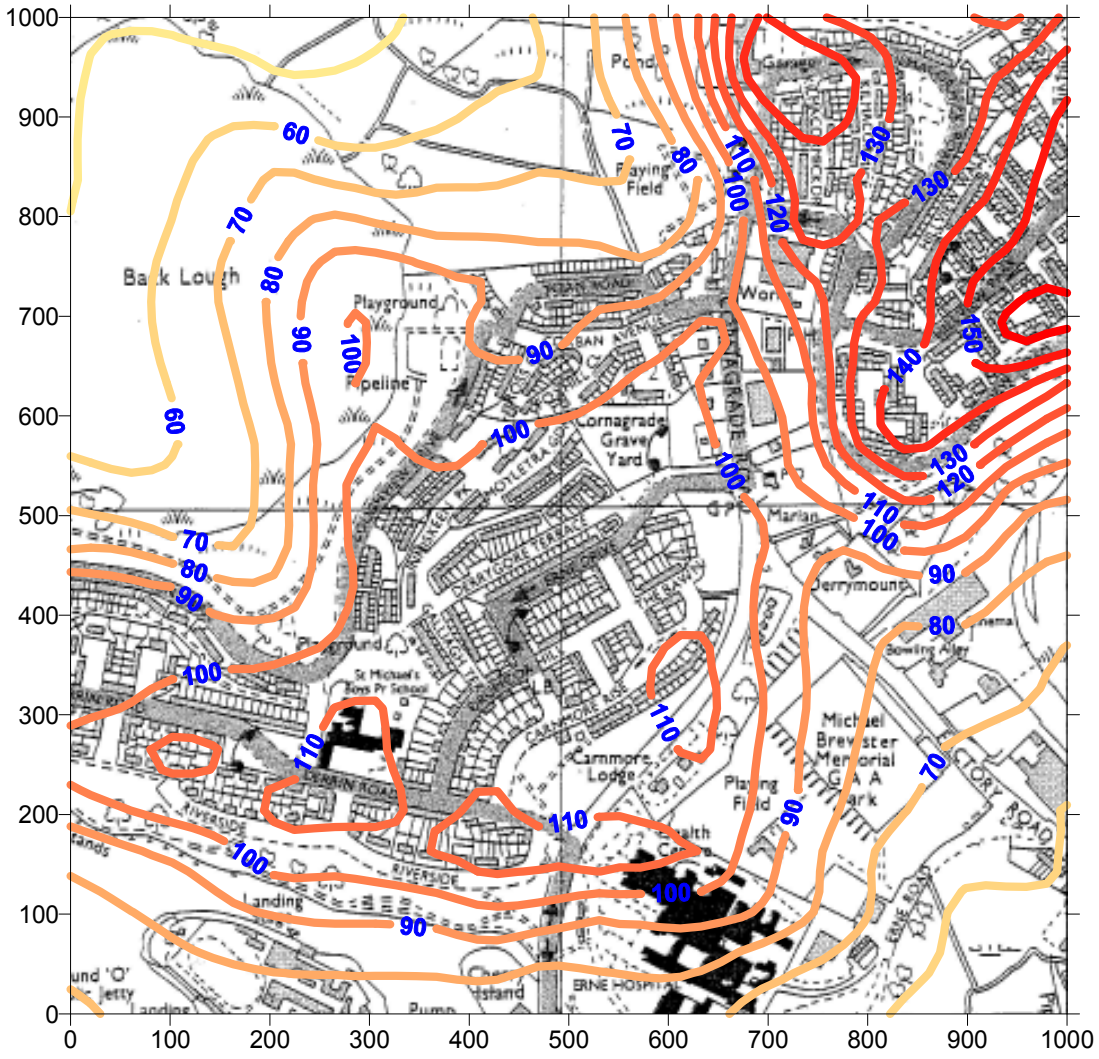


Fig 5.1(b) A contour plot of SO_2 concentrations predicted by the modelling relevant to the 15 minute mean objective, without a correction for model/monitor bias.



5.7.2 PM_{10}

Figure 5.2a shows modelled PM_{10} concentrations in the 1 km grid square in Enniskillen in 1999, **uncorrected** for model bias. The model predicts that the 90th percentile of 24 hour PM_{10} concentrations **will not be exceeded** in the grid. The highest concentrations are predicted in the north east area. This is due to a higher concentration of housing in this area.

Figure 5.2b shows modelled PM_{10} concentrations in the 1 km grid square in Enniskillen in 1999, **corrected** for model bias using the bias adjustment factors used by Strabane. The model predicts that the 90.41 percentile of 24 hour PM_{10} concentrations **will be exceeded** in the grid. The highest concentrations are predicted in the north east area. This is due to a higher concentration of housing in this area.

Figure 5.2(a) A contour plot of PM_{10} concentrations predicted by the modelling relevant to the 24 hour objective, without a correction for model/monitor bias

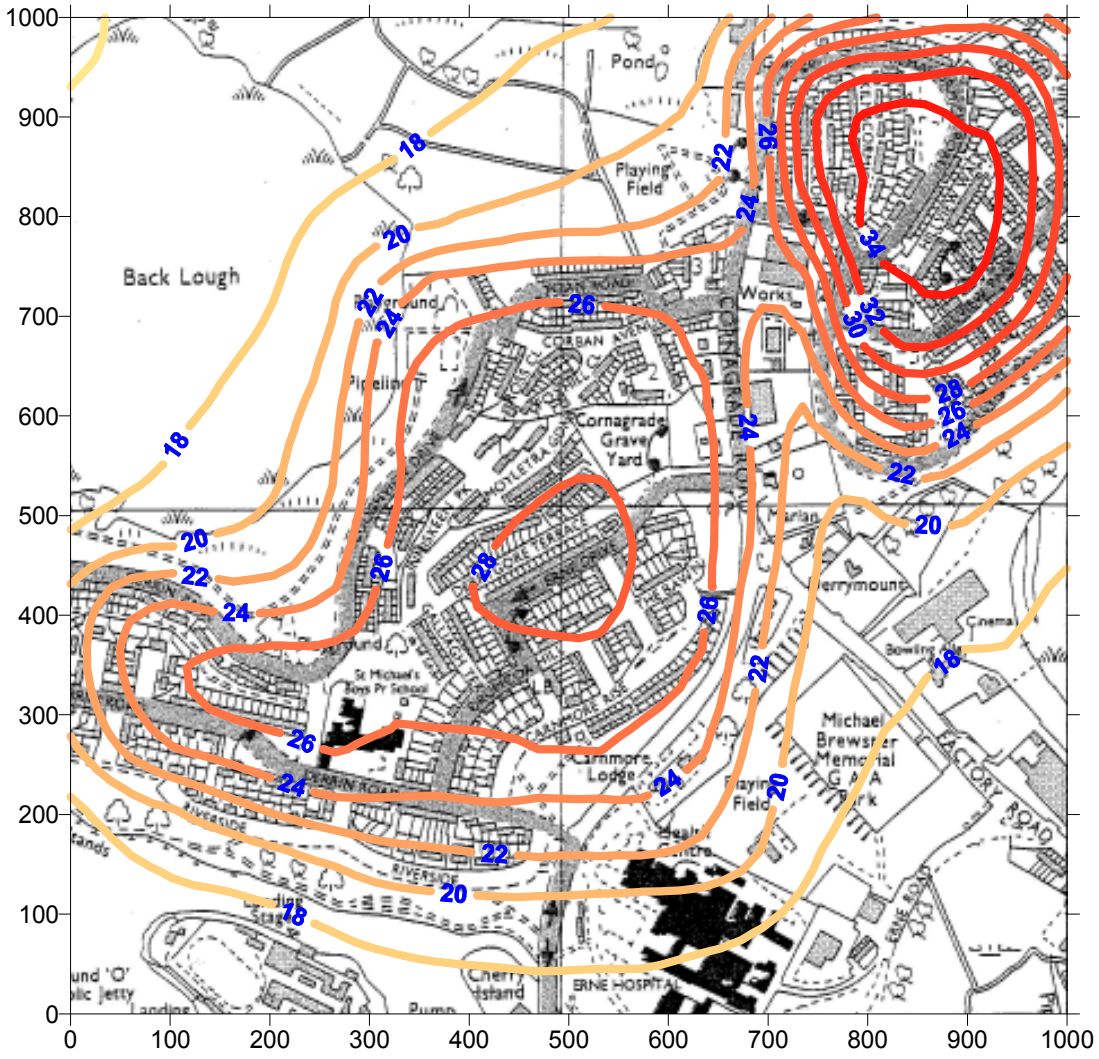
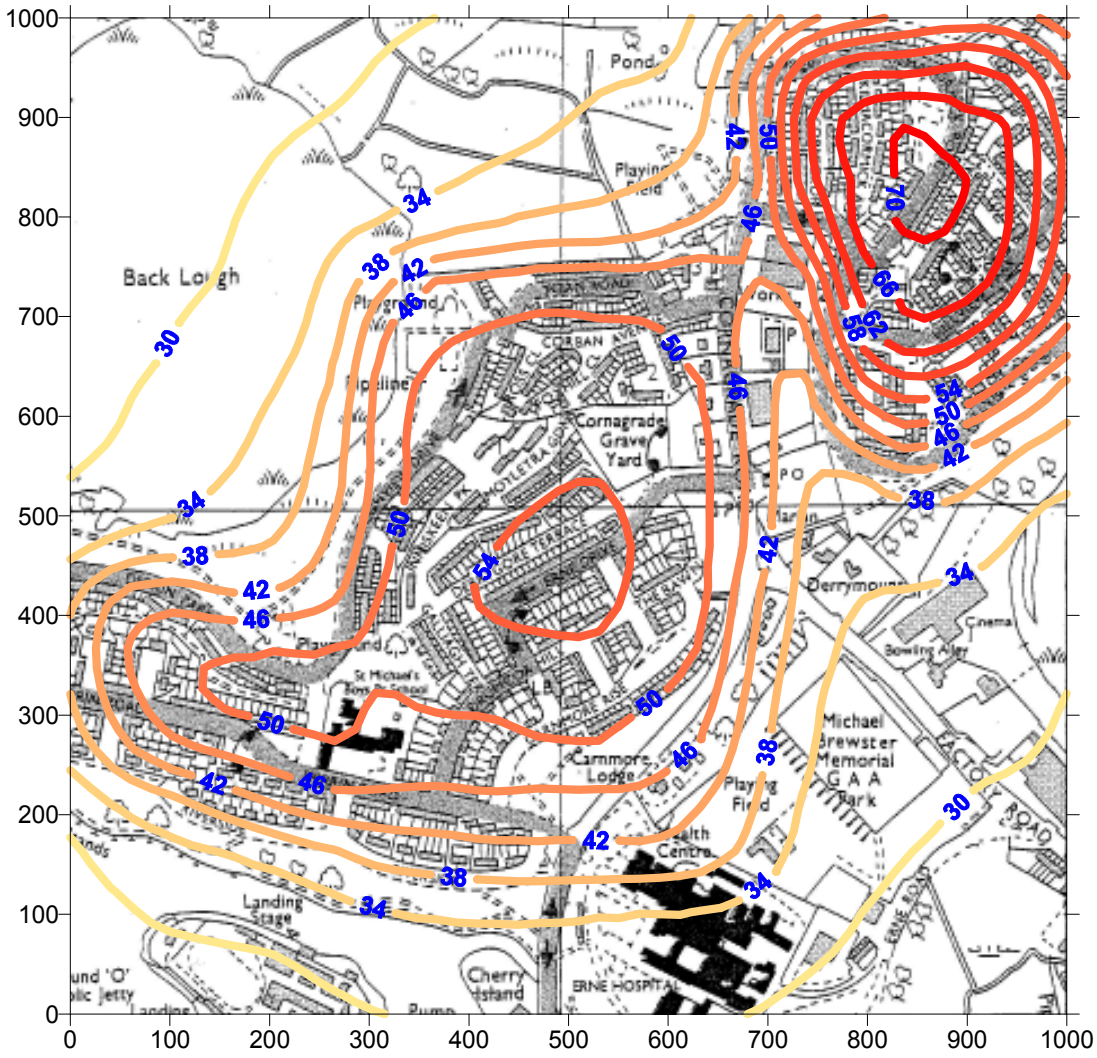


Figure 5.2(b) A contour plot of PM_{10} concentrations predicted by the modelling relevant to the 24 hour objective, with correction for model/monitor bias



5.7.3 Summary of the Likelihood of exceeding the Objectives for SO_2

Detailed modelling using ADMS version 3.1 has been undertaken at a 1 km grid square in Enniskillen where large amounts of domestic fuel burning is common. The modelling predicts that exceedances of the SO_2 objectives are unlikely. Strabane's bias has been used to correct the model in this case as the best available information. However for an increased certainty the model would be corrected using monitoring data from Fermanagh.

A comparison of the monitoring data recorded at Belfast East during April 2002 to January 2003 (when the continuous monitor at Springhill Park was in operation) with data recorded during 1999, 2000 and 2001 showed that during the time that the Strabane site has been in operation, far lower values have been recorded than in previous years. Therefore the data recorded so far at Springhill Park may not be representative of future concentrations.

5.7.4 Summary of the Likelihood of exceeding the objectives for PM_{10}

Detailed modelling using ADMS version 3.1 has been undertaken at a 1 km grid square in Enniskillen where large amounts of domestic fuel burning is common.

The modelling (corrected for model bias) has predicted that an exceedance of the PM_{10} objectives is likely. As the model correction has been made using a bias from the neighbouring Local Authority, Strabane, there is a much higher degree of uncertainty associated with this result than if Fermanagh had had their own data. Netcen therefore recommended that Fermanagh carry out monitoring in the area of predicted highest PM_{10} concentrations and then reconsider the modelling with the monitoring data to support it.

Despite extensive surveys a suitable monitoring site could not be identified within this modelled area.

5.8 Re-run of Domestic Fuel Use Modelling

Early in 2004 Netcen was requested to reassess the particulate matter (PM_{10}) concentration in the Devenish area of Enniskillen (Cornagrade, Hillview and Kilmacormick) using the ADMS model. Since the completion of the previous modelling studies, which suggested there would be a likely exceedance of the 24 hour PM_{10} objectives, new fuel use data became available, as well as more locally accurate PM_{10} monitoring data from neighbouring Omagh.

The new fuel use data showed that thirty-five properties would switch away from coal towards oil as the main form of heating by 2006 due to improvements instigated by the Northern Ireland Housing Executive. This change in fuel use was incorporated into the model. The methodology used for the modelling process was identical to that used in the previous modelling study.

PM_{10} concentrations in a dense coal burning area of Omagh were measured continuously by the Omagh Tamlaght monitoring station, and used in the Fermanagh modelling to correct for model bias. Data was available from 26th September 2003 to 5th May 2004, however to assess concentrations against the PM_{10} objective a year's worth of data is required. Therefore, concentrations recorded at Omagh Tamlaght were compared against data recorded throughout 2003 at Derry and Strabane Springhill Park. It was found that at both Strabane and Derry similar 90th percentile daily mean concentrations were recorded in 2003, and when the Omagh Tamlaght site has been in operation. Therefore, the 90th percentile daily mean concentration recorded at Omagh Tamlaght of 28 $\mu g/m^3$ between September 2003 and May 2004 has been taken as representative of concentrations throughout 2003.

As domestic modelling was previously carried out for Omagh using the same methodology as in Fermanagh the bias has been calculated using model outputs from Culmore in Omagh, which have then been applied to the Fermanagh modelling. Table 5.9 shows the main elements of the bias correction calculations.

The data from the continuous monitor at Omagh Tamlaght has been ratified by Netcen. The data conforms to the QA/QC standards used in the DEFRA network.

Table 5.9 Main Elements used in the calculation of the bias correction factor

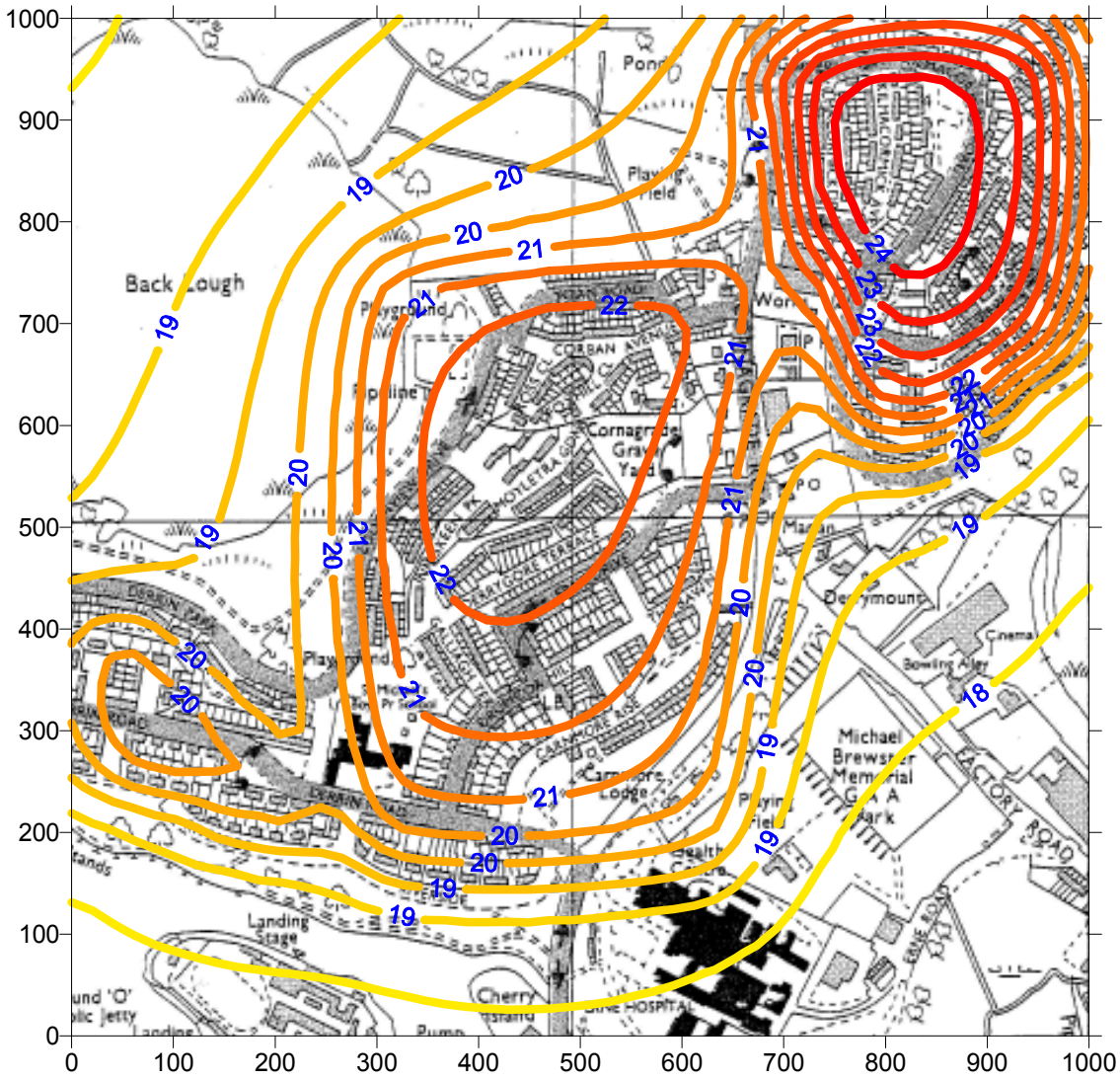
Element	Factor used	PM_{10} concentration ($\mu g/m^3$)	Source of factor or model used
Measured concentration Measured at the Omagh Tamlaght site (26/09/03 – 05/05/04)		28	Monitoring (90^{th} percentile daily mean)
Background concentration at monitoring site 2004		14.9	NAEI
Modelled concentrations at Omagh Tamlaght Modelling contribution of domestic emissions at monitoring site		5.47	ADMS (annual average)
90^{th} percentile daily mean modelled and background	(14.9 + 5.47) * 1.68	34.2	
Difference (bias in the model)	28/34.2	0.818	

Note: Totals may not necessarily agree with the sum of their components due to rounding. To convert from the annual mean PM_{10} to the 90^{th} percentile daily mean of a figure of 1.68 has been used as provided in the Pollution Specific Guidelines (OO).

Detailed modelling was undertaken using the new data at the same 1x1km square grid in Enniskillen where large amounts of domestic fuel burning is common. The results of this modelling showed that the maximum 90^{th} percentile daily mean PM_{10} concentration was approximately 24 $\mu g/m^3$ (see Figure 5.3). The daily mean objective to be achieved by 31^{st} December 2004 is 50 $\mu g/m^3$.

The modelling therefore suggests that an exceedance of the 24 hour PM_{10} objective is unlikely.

Figure 5.3 Contour plot of predicted 90th percentile 24 hour mean PM_{10} concentrations, with correction for model/monitor bias (µg/m^3)



5.9 Conclusions for SO_2 and PM_{10}

5.9.1 Sulphur Dioxide

The modelling results suggest that it is unlikely that there will be an exceedance of the 15 minute mean SO_2 objective in the modelled area. This is the most stringent SO_2 objective and therefore if this is predicted to be met then it is likely that the hourly and daily SO_2 objectives will also be met.

Strabane's bias has been used to correct the model. However for an increased certainty the model would ideally be corrected using monitoring data from Fermanagh.

It is <u>not</u> recommended that Fermanagh District Council consider declaring an AQMA for sulphur dioxide from domestic fuel burning.

5.9.2 PM_{10}

From the re-modelling it can be concluded that an exceedance of the 24 hour PM_{10} objective is unlikely and it is <u>not</u> recommended that Fermanagh District Council consider declaring an AQMA for PM_{10} from domestic fuel burning.

APPENDIX I

Proposed Objectives included in the Air Quality Regulations (NI) 2003 for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	running annual mean	31.12.2003
	3.25 µg/m^3	running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	running annual mean	31.12.2003
Carbon monoxide	10.0 µg/m^3	maximum daily running 8-hour mean	31.12.2003
Lead	0.5 µg/m^3	annual mean	31.12.2004
	0.25 µg/m^3	annual mean	31.12.2008
Nitrogen dioxide[1]	200 µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 µg/m^3	annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)[2]	50 µg/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
Sulphur dioxide	350 µg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 µg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 µg/m^3 not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

[1] The objectives for nitrogen dioxide are provisional

[2] Measured using the European gravimetric transfer standard or equivalent.

APPENDIX II

Nitrogen Dioxide Diffusion Tube Results 2000/2001

Diffusion tube results for Fermanagh			Results in µg/m3	
Month	**Site 1**	**2**	**3**	**4**
Apr-00	6.9	24.2	Na	6.5
May-00	7.3	21.9	2.7	5.2
Jun-00	6.7	23.5	3.7	4
Jul-00	n/a	22.3	4	4
Aug-00	8.5	22.3	5.2	6.7
Sep-00	10	26.9	5	7.5
Oct-00	10.6	24.6	6	6.3
Nov-00	8.5	18.7	5.2	na
Dec-00	8.1	18.8	4	5.8
Jan-01	7.6	16.7	5.8	4.3
Feb-01	9.1	20.3	5.8	7.3
Mar-01	6.3	16.3	4	4.5
Apr-01	2.4	13.5	2.1	3.6
May-01	6.8	17.2	3.7	3.7
Jun-01	6.4	23.5	3.7	3.7
Jul-01	3.7	16.4	2.6	3
Aug-01	9	22.3	4.1	5.1
Sep-01	9.2	22.8	4.4	5.8
Oct-01	8.2	20.5	4.6	6
Nov-01		28.3	7	8.6
Average (uncorrected for bias) in 2001	7.5	19.8	4.3	5.1
Average (corrected for bias)	11.0	29.0	6.4	7.4
Prediction in 2005		26.3	5.8	6.7

Site 1	Intermediate	
Site 2	Kerbside	
Site 3	Urban background	
Site 4	Urban background	
Lab: Ruddock & Sherrat	bias in 2001	-46.50%
	in 2000	-13.70%

APPENDIX III

Nitrogen Dioxide Diffusion Tube Results 2002/2003 ($\mu g\ m^3$)

2002	Belmore St	Anne St	Henry St
May	18	17	31
June	18.4	14.7	27.9
July	10.2	N/A	22.6
August	15.4	12.1	15.4
September	28.4	19.6	22.4
October	20.5	19.9	27.2
November	20.5	21	22.2
December	23.8	32.9	12.6
2003			
January	18.5	16.7	28.8
February	26.5	26.4	28.1
March	26.4	27.9	24
April	30.8	32.4	32.4
May	23.2	18	29.6
June	25.2	24.3	31.7
July	21.2	21.9	32.2
August	N/A	19.8	26.3
September	22.2	22.8	29.5
October	19.6	17.5	27.8
November	22.6	21.7	29.9
December	20.8	18.3	27.5