Local Air Quality Management

Updating & Screening Assessment

1.0 Introduction

1.1 Review and Assessment of Air Quality

Under Part IV of the Environment Act 1995 local authorities are required to review and assess air quality in their areas to identify areas where air quality is unlikely to meet the objectives prescribed by the Air Quality Regulations 2000 within the relevant periods

The Government has recommended a phased approach to the review and assessment process, the intention being that local authorities only undertake as much work as necessary dependent upon the extent of the air quality problems in their area.

The Act requires that local authorities review the air quality in their areas with regard to seven specified pollutants; nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon dioxide (CO), lead, fine particles (PM_{10}), benzene, and 1,3-butadiene. The Governments Expert Panel on Air Quality Standards (EPAQS) has recommended air quality standards for these pollutants based upon their health effects. These have been translated into a set of statutory objectives, which must be met between 2003 and 2008 dependent upon the pollutant.

Where a local authority finds that a prescribed objective is likely to be exceeded it must declare an Air Quality Management Area and draw up an action plan identifying changes that will be necessary to improve air quality.

Air pollution is trans boundary. This emphasises the need to assess air quality in a more holistic manner. The Tyne and Wear Management group will act to provide information and to support other strategies to enhance air quality.

The review was carried out in light of the new guidance ‘Local Air Quality Management’ Technical Guidance TG(03) issued by the government and devolved administrations. This review will follow a two-step approach. The first step is an Updating and Screening Assessment, which assesses the risk of an air quality objective being exceeded. This is followed by a detailed assessment to provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposures.

The Air Quality Strategy contains standards and objectives for eight air pollutants; carbon monoxide, benzene, lead, nitrogen dioxide, sulphur dioxide, fine particulates (PM10) and ozone. All except ozone are the direct responsibility of local authorities. The standards are health-based targets based upon health effects and set at a level below which no health effects should occur. The objectives are policy targets, which state the maximum concentration for a pollutant and take into account cost and benefit of meeting the standard. The objectives were revised by the Air Quality Regulations 2000 and the Air Quality (Amendment) Regulations 2002 which set new deadlines for achievement and range from 2003 and 2010. In addition the E U have set limit values in respect of nitrogen dioxide and benzene to be achieved by 1 January 2010 as well as indicative limit values for PM10 to be achieved by 2010. The EU limits are currently not required to be reviewed although will be

required to be considered in the future. The objectives are summarised in table 1.

Table 1 Standards and Objectives for Specific Pollutants

Objectives laid down in Regulations for the purposes of LAQM			
Pollutant	**Objective Concentration**	**To be achieved by Measured as**	
Benzene	16.25ug/m^3 (5ppb)	running annual mean	31 Dec 2003
1,3-Butadiene	2.25ug/m^3 (1ppb)	running annual mean	31 Dec 2003
Carbon Monoxide	11.6mg/m^3 (10ppm)	running 8 hour mean	31 Dec 2003
Lead	0.5ug/m^3 0.25ug/m^3	annual mean annual mean	31 Dec 2004 31 Dec 2008
Nitrogen Dioxide	200ug/m^3 (105ppb) not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40ug/m^3 (21ppb)	annual mean	31 Dec 2005
Particles (PM_{10})	50ug/m^3 not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
	40ug/m^3	annual mean	31 Dec 2004
Sulphur dioxide	350ug/m^3 (132ppb) not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125ug/m^3 (47ppb) not to be exceeded more than 3 times a year	24 hour mean	31 Dec 2004
	266ug/m^3 (100ppb) not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005

1.2 The Character of Tyne & Wear

The Tyne & Wear region covers an area of 54,006 hectares, with a population of 1.134 million. The conurbation centres around two major rivers with a mixture of large urban and rural areas.

A substantial rail and road network covers the region, which includes a number of motorways and trunk roads, primary roads, principal roads and other classified and non-classified routes. A comprehensive network of bus services operates in Tyne & Wear, as well as a Metro light rail network. Both regional and national rail systems and freight also operate. Passenger ferries and freight shipping services operate from the Port of Tyne and cargo traffic enters and leaves the Port of Sunderland.

Cars form the bulk of traffic on the roads - car ownership in Tyne & Wear increased by about 44% between 1980 and 1996, broadly in line with national trends. If existing trends continue, further substantial increases in car ownership can be anticipated. This, together with the expected increase in commercial traffic will lead to greater pressure on the road system. Traffic flows vary throughout the region and build up in the inner urban areas.

Air quality in Tyne & Wear may also be influenced by sources external to the region, notably power generation and metal refining activities. The region is bounded to the east by the North Sea, which is considered to be a source of natural particulates - sea salt- that contribute to the overall particulate level in the region.

1.3 Findings of First Phase: Review and Assessment in Tyne & Wear

During 1998 all UK local authorities commenced reviews of their air quality to identify any local problems arising from these pollutants. The five local authorities in Tyne & Wear commenced an initial, first stage screening process reviewing the potential significant sources of each of the identified pollutants.

The first stage review and assessment of local air quality eliminated certain sources of atmospheric pollution and one pollutant from the review and assessment process. Sources of relevant pollutants, which may be significant because of their locations and emission characteristics, were identified for further assessment.

It was established that for one of the relevant pollutants, 1,3-butadiene, no further investigation or assessment was necessary and therefore this pollutant was not subjected to further study during the second stage process.

The remaining six pollutants of local interest and possible significance to be further assessed were identified as nitrogen dioxide, sulphur dioxide, carbon monoxide, benzene, lead and fine particulates (PM_{10}).

The identified pollutants result from emissions to air from road traffic and also originate from fixed industrial and other sources both within and outside the region. Emissions of lead and benzene in significant quantities and concentrations are known to be associated primarily with industrial processes and activities, and are localised as a result. The remaining pollutants, in addition to their possible industrial origins are also associated with major road systems with high traffic flows or which suffer from severe congestion.

The second stage review and assessment involved additional monitoring, simple modelling of road traffic sources, completion of an emission inventory, GIS mapping of significant sources and sensitive receptors together with further discussions with process operators. Where the second stage screening indicated that the relevant air quality objective may not be met by the relevant future year then a third stage review and assessment was undertaken.

Where the third stage was found to be necessary, the pollutants and their significant sources were examined by the use of continued monitoring, emissions inventories and the use of a more complex urban atmospheric dispersion modelling system (ADMS –Urban version 1.53).

Updating and Screening Assessment for Carbon Monoxide

OBJECTIVE: maximum daily running 8-hour mean of 10mg/m^3

2.0 Introduction

The main source of carbon monoxide is road transport which accounted for 67% of total releases in 2000[1]. Studies at a national level, based on both measured and modelling data, suggest that there is little likelihood of the new objective for carbon monoxide being exceeded by 2003[1].
In 2000 the City of Sunderland together with the other Tyne & Wear Local Authorities proceeded to a 2nd and 3rd Stage Review & Assessment (R & A) of carbon monoxide after identifying significant sources during the 1st Stage R & A. The 3rd Stage R & A concluded that results from monitoring data, an emission inventory and atmospheric dispersion modelling had predicted that all statutory objectives would be met for carbon monoxide and therefore no further action was required.

2.1 Updating and Screening Assessment

A Monitoring Data

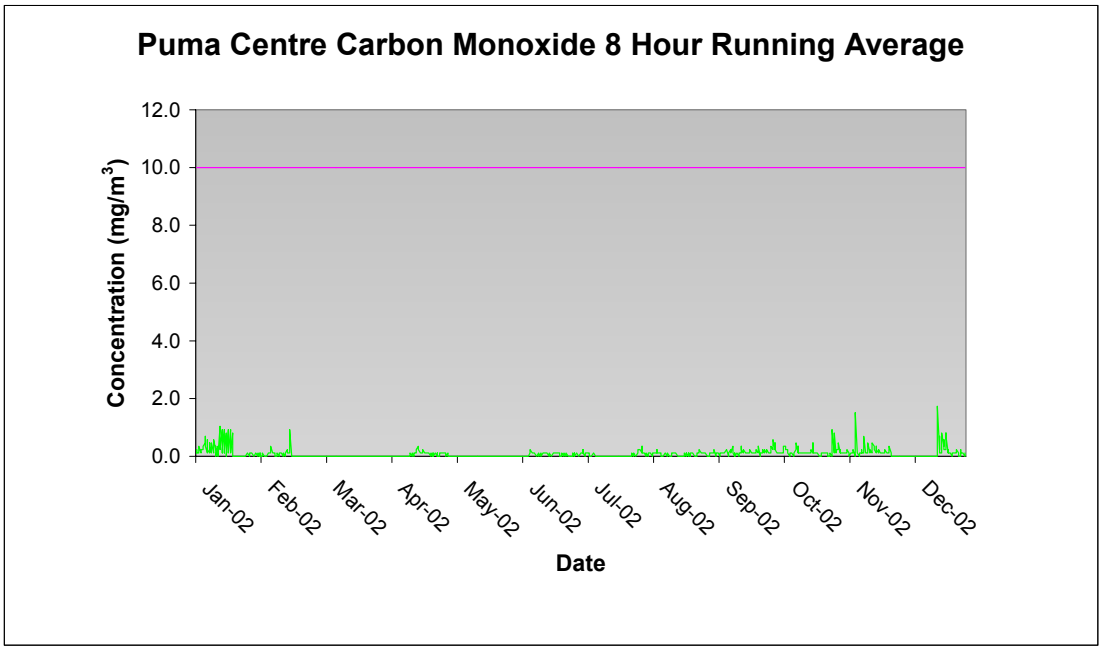
- Table 1.1 shows Carbon Monoxide data for the Sunderland area. The maximum 8-hour means for each site were 1.7mg/m^3 and 4.2 mg/m^3 respectively. There are therefore no running 8 hourly concentrations greater than 10 mg/m^3. Figure 1.2 shows the data for the Puma Centre site.

Table 1.1

Site	Date	No. of exceedences of 8-hour objective (11.6 mg/m^3)	Maximum 8-hour average recorded	Annual Average (Objective = 50 µg/m^3)	Data Capture %
Puma Centre Silksworth	2002	0	1.7	0.1	63
Hetton – le- Hole	Jun 2001-Feb 2002	0	4.2	1.6	72

[1] LAQM.TG(03), 2003

Fig 1.2



B Road Traffic

There are no 'very busy roads' within the City of Sunderland.

A 'very busy road' can be defined as:

- Single carriageways with > 80,000 veh. Per day
- Dual carriageways with > 120,000 veh. Per day
- Motorways with > 140,000 veh. Per day

In addition, background concentrations downloaded from the National Air Quality Information Archive show that no 1kmx1km grid square has a value of greater than 1 mg/m^3.

2.2 Conclusion

- Monitoring data has demonstrated that all statutory objectives for carbon dioxide are currently being met and there are no 'very busy roads' where exceedances might be expected. The City of Sunderland has therefore decided not to proceed to a detailed review and assessment for carbon monoxide.

Updating and Screening Assessment for Benzene

OBJECTIVE: Running annual mean of 16.25 μg/m^3 by 2003
Annual mean of 5μg/m^3 by 2010.

3.0 Introduction

The main sources of benzene within the City of Sunderland are petrol-engined vehicles, petrol station forecourts and one industrial source - a major fuel storage depot.

In 2000 the City of Sunderland together with the other Tyne & Wear Local Authorities proceeded to a 2nd and 3rd Stage Review & Assessment (R & A) of benzene after identifying significant sources during the 1st Stage R & A. The 3rd Stage R & A concluded that results from monitoring data, an emission inventory and atmospheric dispersion modelling had predicted that all statutory objectives would be met for benzene and therefore no further action was required.

3.1 Updating and Screening Assessment

A Monitoring Data

- No further monitoring of benzene levels has been undertaken since the last round of R & A within Sunderland as previous exercises had shown levels to be well below the objective. This data has now been compared against the additional objective of 5μg/m^3 to be achieved by 2010.

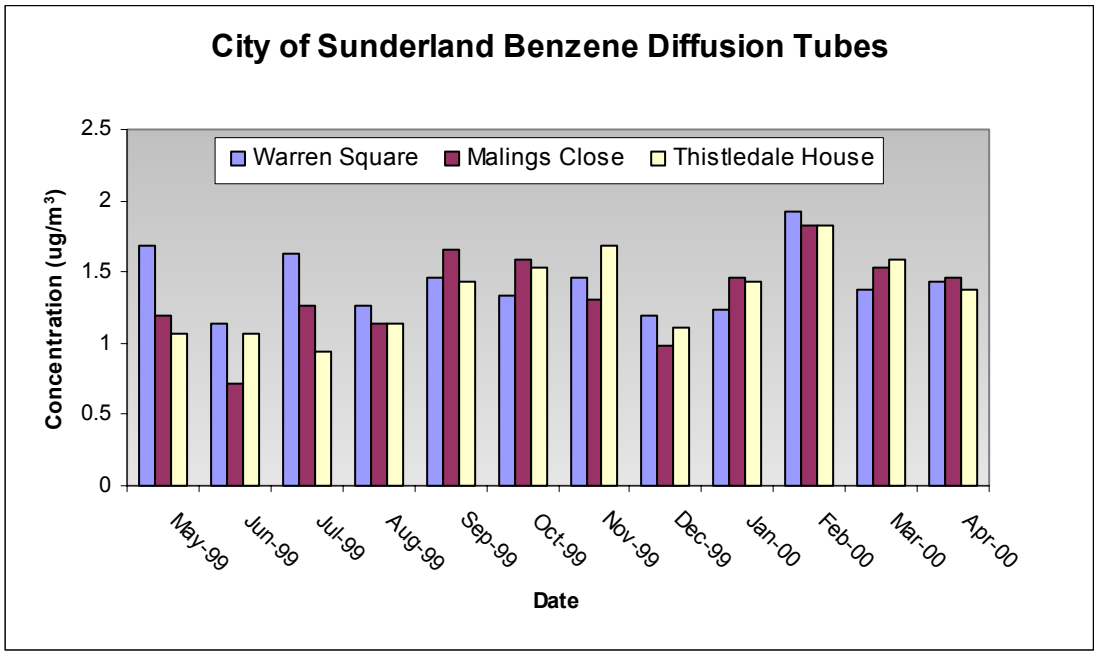
- Diffusion tube surveys were carried out in three residential areas adjacent to the port area of Sunderland where the petrol terminal is situated. The results are shown in Fig 2.2 with a summary shown in table 2.1 below. Correction factors were not applied, as the concentrations were not measured at roadside sites.

Table 2.1

Site Name	Monitoring Period	Highest monthly average μg/m^3	Average over monitoring period μg/m^3
Warren Square	May 1999 – Apr 2000	1.92	1.43
Malings Close	May 1999 – Apr 2000	1.82	1.27
Thistledale House	May 1999 – Apr 2000	1.82	1.35

The results show that the concentrations are well below the 2010 objective of 5 μg/m^3. Therefore there is no need to proceed to a detailed assessment on the basis of monitoring data.

Fig 2.2



B Road Traffic

There are no 'very busy roads' within the City of Sunderland.

A 'very busy road' can be defined as:

- Single carriageways with > 80,000 veh. Per day
- Dual carriageways with > 120,000 veh. Per day
- Motorways with > 140,000 veh. Per day

C Industrial Sources

- There are no new industrial sources, which are listed in annex 2 of LAQM TG (03) therefore there is no requirement to consider these sources any further.

D Other Sources

- There are no petrol stations within the City of Sunderland that have an annual throughput of more than 2000m^3 of petrol and are near a road with more than 30,000 vehicles per day and have relevant exposure within 10m of the pumps.

  A new monitoring programme is currently being undertaken by the City of Sunderland which will involve placing diffusion tubes at locations which are both near busy roads and petrol stations.

E Major Fuel Storage Depots

- There is one major fuel storage depot situated within the City of Sunderland. This is Sunderland Oil Storage Ltd, which is situated in the Port area of Sunderland in Hendon. The distance to the nearest relevant exposure is approximately 650 metres. The depot had an annual throughput of 377,959 tonnes of fuel in 2002.
  The emissions helpdesk was contacted to provide advice on calculating annual emissions. They were unable to provide data for Sunderland Oil Storage Ltd but were able to provide information from another similar fuel storage site. A figure of 0.48 tonnes per annum of benzene was calculated based on an emission of 91 tonnes per annum of VOC's. This figure was compared with the nomogram in figures 3.3 and 3.4 in LAQM.TG (03) to determine if the source requires further assessment.
  The threshold was not exceeded in the nomogram for both the 2003 and 2010 objectives therefore it is not necessary to proceed to a detailed assessment for this source.

3.2 Conclusion

- Monitoring data has demonstrated that all statutory objectives are currently being met for the 2003 objective and are expected to be met for the 2010 objective. Road and industrial sources have been screened and do not need further assessment. City of Sunderland has therefore decided not to proceed to a detailed review and assessment of benzene, However due to the lack of monitoring data at combined busy road and petrol station sites the City of Sunderland has decided to institute a monitoring regime with benzene diffusion tubes and will report the results of this monitoring in the 2005 Progress Report.

Updating and Screening Assessment for 1,3-butadiene

OBJECTIVE: Running annual mean of 2.25 μg/m^3 by 2003

4.0 Introduction

The main source of 1,3-butadiene in the UK is emissions from motor vehicle exhausts. It is also an important industrial chemical. LAQM. TG (03) states that only authorities with relevant locations in the vicinity of major industrial processes that handle, store or emit 1,3-butadiene are expected to proceed beyond the updating and screening assessment.
In the 1st round of R&A the Tyne & Wear Authorities decided not to proceed any further as there were no significant sources of 1,3-butadiene within Tyne & Wear.

4.1 Updating and Screening Assessment

A Monitoring Data

- There has been no monitoring carried out in Sunderland for 1,3-butadiene as there has been no risk of exceeding the objectives at any location.

B New Industrial Sources

- There are no new industrial sources, which are listed in annex 2 of LAQM TG (03) therefore there is no requirement to consider these sources any further.

C Industrial sources with substantially increased emissions

- Not applicable as there were no potentially significant industrial sources identified during the 1st round of R & A.

4.3 Conclusion

- City of Sunderland has decided not to proceed to a detailed review and assessment of 1,3-butadiene.

Updating and Screening Assessment for Lead

OBJECTIVE: annual mean of 0.5μg/m by 2004
annual mean of 0.25μg/m^3 by 2008

5.0 Introduction

With the ban on sales of leaded petrol since 1 January 2000, emissions of lead in the UK are now restricted to industrial activities. Only those authorities with relevant locations in the vicinity of major industrial processes that emit significant quantities of lead will need to proceed beyond the updating and screening assessment. In the first Review and Assessment the City of Sunderland considered one potential industrial source of lead however following monitoring the process was deemed not to be a significant source.

5.1 Updating and Screening Assessment

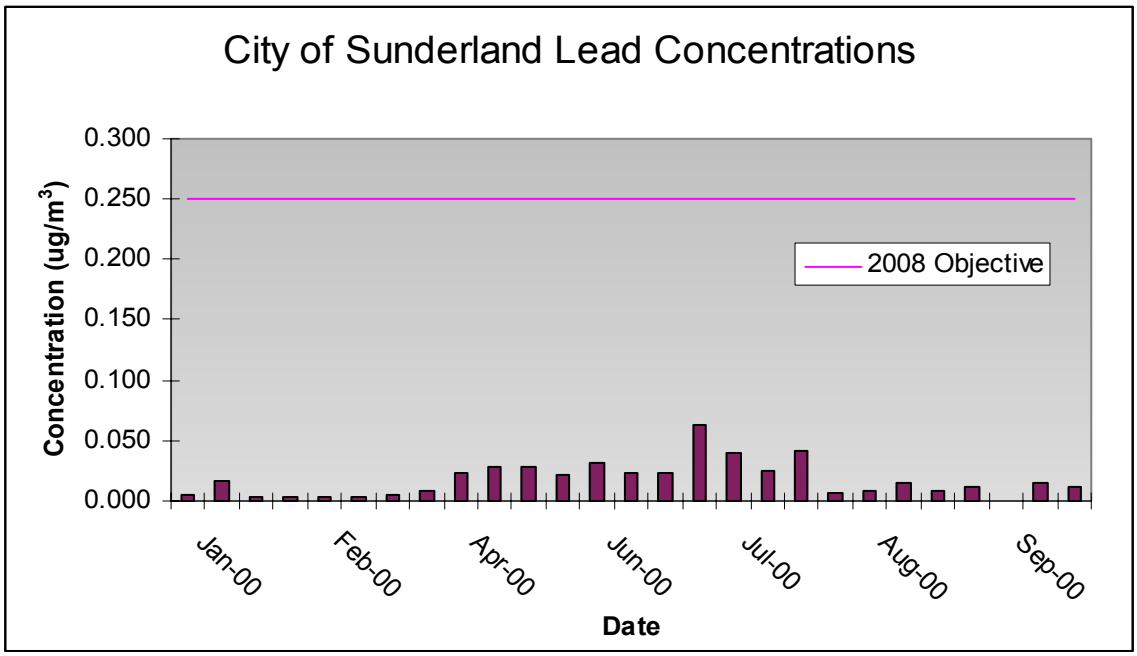
A Monitoring Data

- No further monitoring of lead levels has been undertaken since the last round of R & A within Sunderland as previous exercises had shown levels to be well below the objective.

- The first round of R&A identified only one potential significant source of airborne lead - Jennings Winch & Foundry Company Ltd. This Part B process is located close to residential areas and a primary school so was the subject of a monitoring programme in 2000.

- The results are shown in Figure 4.1 and the average concentration over the 9-month monitoring period was 0.017μg/m^3 and the highest measured concentration was 0.062μg/m^3. These results are well below the 2008 objective of 0.25μg/m^3. Therefore there is no need to proceed to a detailed assessment on the basis of monitoring data.

Fig 4.1



B New Industrial Sources

- There are no new industrial sources, which are listed in annex 2 of LAQM TG (03) therefore there is no requirement to consider these sources any further.

C Industrial sources with substantially increased emissions

- The potential significant source identified during the last round does not have substantially increased emissions.

5.2 Conclusion

- Monitoring data has demonstrated that all statutory objectives are expected to be met in 2004 and 2008. Industrial sources have been screened and do not need further assessment. City of Sunderland has therefore decided not to proceed to a detailed review and assessment of lead.

Updating and Screening Assessment for Nitrogen Dioxide

OBJECTIVE: annual mean of 40 g/m^3 by 2005 1-hour mean of 200μg/m^3 not to be exceeded more than 18 times per year by 2005

6.0 Introduction

The major source of nitrogen dioxide within the City of Sunderland is from road traffic. The Tyne & Wear Urban Emission Inventory states that 73% of nitrous oxides within the region are emitted form this source. Other sources include Industrial processes, industrial & commercial combustion and domestic combustion.

The City of Sunderland together with the other Tyne & Wear Local Authorities proceeded to a 2nd and 3rd Stage Review & Assessment (R & A) of nitrogen dioxide after identifying significant sources during the 1st Stage R & A. The 3rd Stage R & A concluded that results from monitoring data, an emission inventory and atmospheric dispersion modelling had predicted that all statutory objectives would be met for nitrogen dioxide and therefore no further action was required.

The City of Sunderland have continued to assess nitrogen dioxide concentrations since the last round of R & A and this information together with any pertinent long term data is presented under the following headings:

6.1 Updating and Screening Assessment

A Monitoring Data (outside an AQMA)

- Continuous monitoring of nitrogen dioxide has been carried out at:

  Trimdon Street, City Centre
  Puma Centre, Silksworth
  Station Road, Hetton-le-Hole
  Bridge Street, City Centre

  Appendix 2 provides site descriptions of continuous analyser sites.

- Table 5.1 shows a summary of continuous monitoring results. There are currently no exceedences of either the 1-hour or annual objective at all sites. Figures 5.2 and 5.3 show monitoring data for the Trimdon Street and Puma Centre sites respectively for 2002.

  The Trimdon Street site data shows a large difference between the 2001 and 2002 annual means with the latter being considerably lower than the 2001 mean. In fact it is lower than the Puma Centre site for the same year. It would be expected that the Trimdon Street site would

have a higher annual mean than the Puma Centre, as it is a kerbside site whereas the Puma centre is an urban background site.
After receiving some advice from the Review and Assessment helpdesk it was concluded that this data was not reliable due to the possibility that the analyser was not functioning correctly. This problem is being investigated and rectified so that future data should be of reliable quality.

Table 6.1

Site	Year	No. of exceedences of hourly objective (200 µg/m^3)	Maximum 1-hour average recorded	Annual Mean (Objective = 40 µg/m^3)	Data Capture %
Trimdon Street	2001	0	123.2	30.2	94.9
Trimdon Street	2002	0	95.9	19.3	88.6
Puma Centre	2002	0	92.6	19.7	80.6
Hetton-le-Hole	Jun 2001-Feb 2002	0	144.6	18.3	49.8
Bridge Street	Jul 1998-Mar 1999	0	125.7	32.6	83.3

Fig 6.2

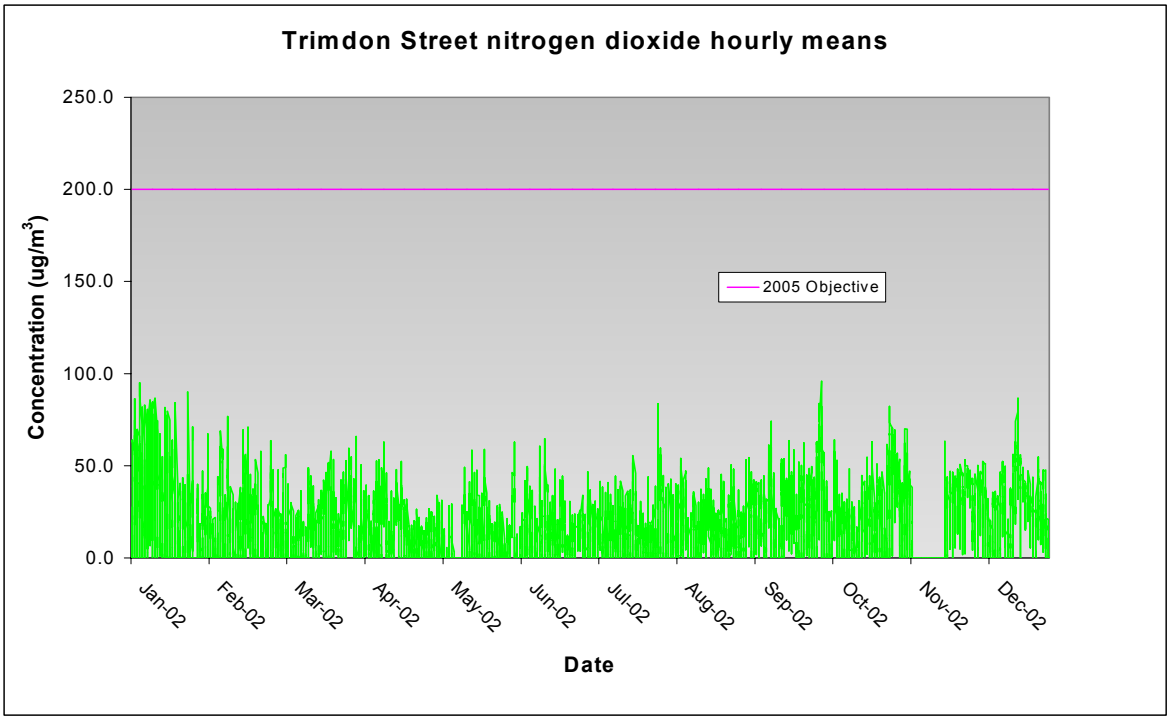
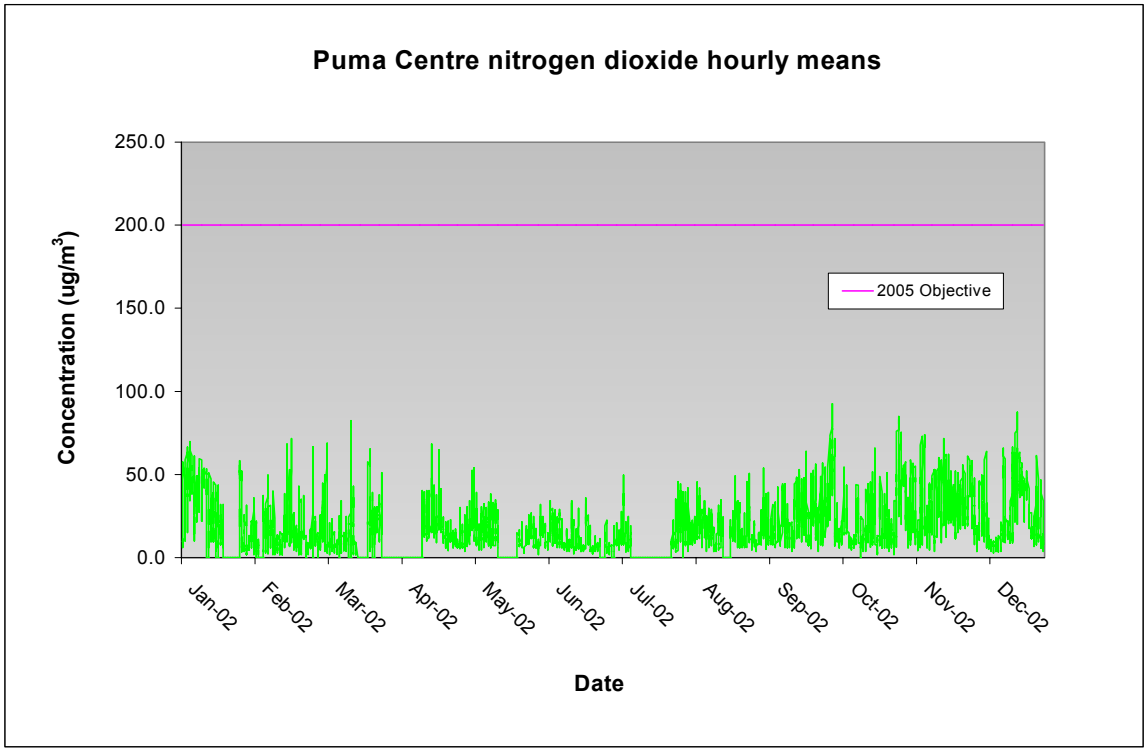


Fig 6.3



- LAQM. TG(03) states that correction factors to estimate annual average NO_2 concentrations in future years can be used for roadside or kerbside sites. Table 6.4 shows the future nitrogen dioxide concentrations from measured data in City of Sunderland.
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Table 6.4

Site	Year	Annual Mean (Objective = 40 µg/m^3)	Predicted Annual Mean for 2005	99.8th %ile of current concentrations
Trimdon Street	2001	30.2	26.9	90.8
Trimdon Street	2002	19.3	17.8	58.0
Hetton-le-Hole	Jun 2001-Feb 2002	18.3	16.3	55.0
Bridge Street	Jul 1998-Mar 1999	32.6	27.1	98.0

- All sites meet the objectives for the predicted annual mean in 2005. The 99.8th %ile has also been calculated using current concentrations, as there is no straightforward way to project future exceedances. The results of these calculations are shown in table 6.2 and all sites are well below the hourly objective of 200 µg/m^3.

- Diffusion Tube monitoring has been undertaken at various sites within the City of Sunderland for several years. Since the last round of R&A diffusion tube monitoring has been undertaken at 29 sites, mostly concentrated on roadside sites throughout the City. Details of the sites can be found in Appendix 2.

- Diffusion tubes have been co-located in triplicate with a chemiluminescence analyser at both the Trimdon Street and Puma Centre Site to enable a bias adjustment factor to be calculated and applied to the diffusion tubes. Because of the unreliable nature of the 2002 Trimdon Street Site data it was decided to use the Puma Centre Site 2002 data to calculate the factor. This is an urban background site so is probably a more representative site of the whole of Sunderland. All tubes have been supplied and analysed by Gradko using a tube preparation of 50% TEA in Acetone.

Bias Adjustment (A)

Annual Mean Diffusion tube concentration = 14.73μg/m^3. (Dm)
Annual Mean Chemiluminesence concentration = 19.7μg/m^3. (Cm)

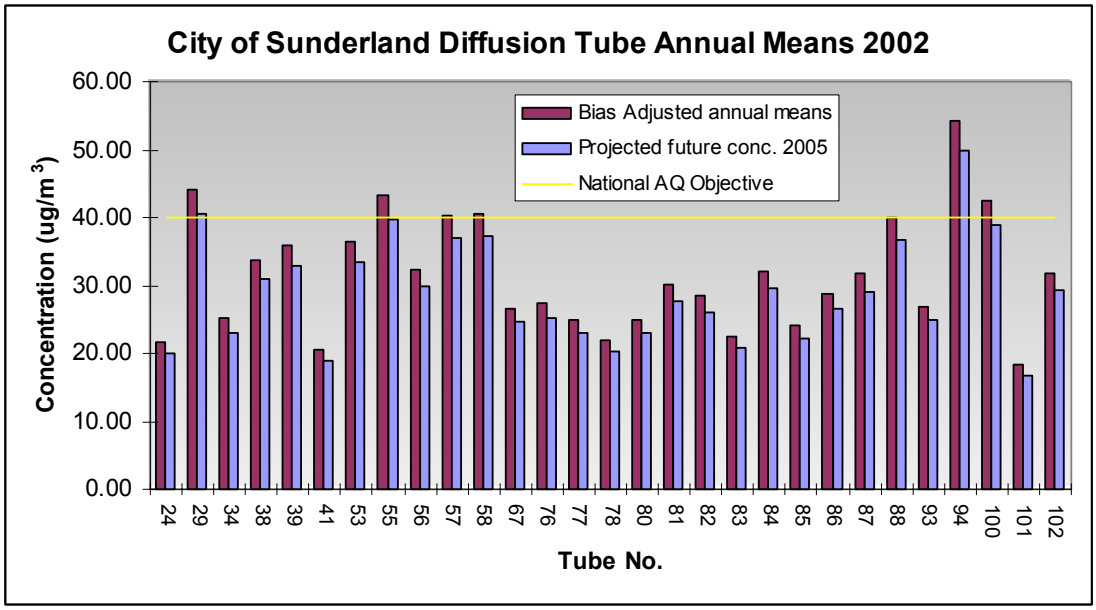
A = Cm/Dm
A = 19.7/14.7 = **1.337.**

Diffusion tube bias (B)

B = (Dm – Cm)/Cm
B = (14.7-19.7) /19.7 = **- 0.25** = Tubes under read by 25%.

- Figure 6.5 shows the results of the diffusion tube annual means for 2002 after they have been bias adjusted. Future predictions for 2005 concentrations were then calculated using these means and the results are also shown in fig. 6.3. Three of the tubes at roadside locations have predicted concentrations in 2005 of over 40μg/m3. These are tube numbers 29, 55 and 92. Tube no. 55 is on the façade of a house in the city centre where long term exposure might be reasonably expected whilst tubes no. 29 and 92 are situated in shopping areas within the city centre where short term exposure would be expected.

Figure 6.5



As diffusion tube data shows that predicted annual means in 2005 are greater than 40µg/m^3, the City of Sunderland will proceed to a Detailed Assessment of nitrogen dioxide to determine whether to declare an AQMA.

B Monitoring Data (inside an AQMA)

- Not Applicable to City of Sunderland

C Narrow congested streets with residential properties close to the kerb

- There are no narrow congested streets as defined in TG(03) in Sunderland

D Junctions

- Using local knowledge and in consultation with the Traffic engineers and GIS analyser, junctions were highlighted in the City of Sunderland which had annual daily traffic flows greater than 10,000 vehicles and with a relevant exposure group within 10 metres of the kerb.

  Data was then obtained on flows, speeds and vehicle types and DMRB modelling carried out as shown in Appendix 1

  There are junctions in Sunderland which display exceedances of the annual objective following DMRB screening.

E Busy streets where people may spend 1 hour or more close to traffic

No outdoor cafes /bars were identified with busy roads greater than 10,000 vehicles per day.

F Roads with high flow of buses and/or HGV's

- There are roads with high flow of buses and/or HGV'S and the information gathered is presented in Appendix 1 together with DMRB. Stockton Road has been identified as an area requiring further detailed assessment

G New roads constructed or proposed since 1st round.

- There has been one major new road proposed since the last round of R & A within the City of Sunderland. The Southern Radial Route has been identified as having a possible effect on local air quality. An Environmental Impact Assessment has been undertaken within which an air quality assessment was included. The results did not predict any exceedences of the objectives at relevant locations so there is no need to proceed further on the basis of new roads constructed or proposed.

H Roads close to the objective during the first round.

- There were no roads identified during the 1st round where annual mean predicted concentrations in 2005 were above 36µg/m^3 but below 40µg/m^3 within the City of Sunderland.

I Roads with significantly changed traffic flows

- There are no roads that have significantly changed traffic flows since the last round of R & A within the City of Sunderland.

J Bus Stations

- The main bus station within the City of Sunderland is situated in the city centre on Park Lane which is a busy shopping area. There are approximately 6250 bus movements per day at the bus station. There are no residential dwellings within 10 metres of the bus station. However, it is likely that members of the public might reasonably be expected to spend 1-hour or longer in the vicinity of the bus station. Therefore DMRB was used to predict the annual mean for 2005 at relevant locations and the results are presented in Appendix 1.

K New Industrial Sources

- There are no new industrial sources since the last round of R & A within the City of Sunderland

L Industrial sources with substantially increased emissions

- There are no industrial sources with increased emissions since the last round of R & A within the City of Sunderland

M Aircraft

- Not applicable to City of Sunderland

6.2 Conclusion

City of Sunderland has decided to proceed to a detailed review and assessment of nitrogen dioxide based on the results of diffusion tube monitoring and the DMRB screening model.

Updating and Screening Assessment for Sulphur Dioxide

OBJECTIVE: 15-minute mean of 266μg/m^3 not to be more Than 35 times per year by 2005
1-hour mean of 350μg/m^3 to be exceeded no more than 24 times per year by 2005
24-hour objective of 125μgm/^{3} to be exceeded no more than 3 times per year by 2004.

7.0 Introduction

Sulphur dioxide has been monitored for many years within the City of Sunderland and the results have shown ambient concentrations have declined. A major factor in this decline has been a reduction of the use of coal due to implementation of Smoke Control Orders within the City.

The City of Sunderland together with the other Tyne & Wear Local Authorities proceeded to a 2nd and 3rd Stage Review & Assessment (R & A) of sulphur dioxide after identifying significant sources during the 1st Stage R & A. The 3rd Stage R & A concluded that results from monitoring data, an emission inventory and atmospheric dispersion modelling had predicted that all statutory objectives would be met for sulphur dioxide and therefore no further action was required.

The City of Sunderland have continued to assess sulphur dioxide concentrations since the last round of R & A and this information together with any pertinent long term data is presented under the following headings:

7.1 Updating and Screening Assessment

A Monitoring Data (outside an AQMA)

- Continuous monitoring of Sulphur Dioxide has been carried out at:

  John Street (AURN site).
  Hetton le Hole
  Bridge Street
  Puma Centre, Silksworth

- The monitoring data from John Street is ratified as part of the Automatic Urban and Rural Network and the analyser has been in situ since 1992. Fig 6.1 shows a comparison of data from the AUN site and Bridge Street site and also shows that there were no exceedances of the 24-hour mean for that period.

  The analyser at the Puma Centre has been in operation for over 12 months however some shorter 6 month monitoring has been carried out at 2 other locations in the City at Bridge Street and Hetton-le-Hole – these results have been viewed as additional information to demonstrate that exceedance of the objective has not occurred.

Figure 6.1

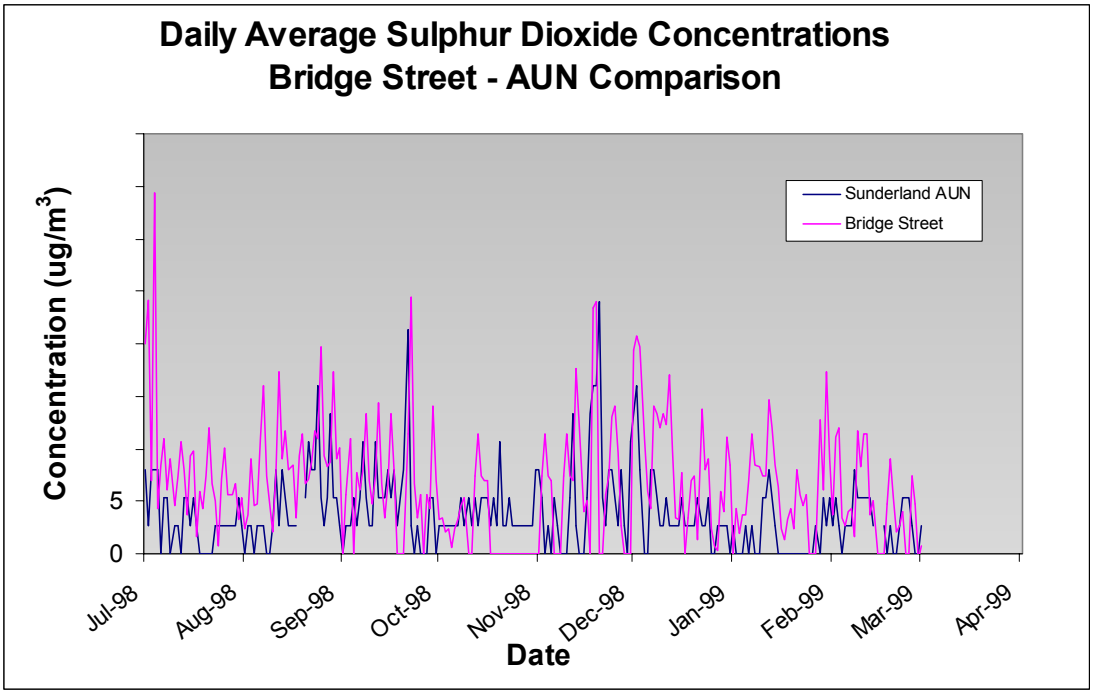


Table 6.2

Site	Date	No. of exceedences of 15-min objective (266 µg/m^3)	Maximum 15-min averages recorded	15 Minute Annual Average	Data Capture %
Puma Centre, Silksworth	2002	0	210.5	10.3	70.8
Hetton-le-Hole	Jun 2001-Feb 2002	0	244.7	22.9	49.8

Table 6.3

Site	Date	No. of exceedences of 1-hour objective (350 µg/m^3)	Maximum 1-hour averages recorded	1 hour Annual Average	Data Capture %
Puma Centre, Silksworth	2002	0	168.9	6.4	70.8
Hetton-le-Hole	Jun 2001-Feb 2002	0	204.3	13.7	49.8

Table 6.4

Site	Date	No. of exceedences of 24-hour objective (125µg/m^3)	Maximum 24-hour averages recorded	24 hour Annual Average	Data Capture %
Puma Centre, Silksworth	2002	0	60.8	6.1	70.8
Hetton-le-Hole	Jun 2001-Feb 2002	0	44.4	11.1	49.8

- The data presented above in tables 6.2, 6.3 and 6.4 shows that none of the three objectives for Sulphur Dioxide (24-hour, 1-hour & 15-minute) have been exceeded. Figure 6.5 shows the hourly means for the Puma Centre site. Therefore it is not necessary to proceed to a detailed R&A on the basis of monitoring data.

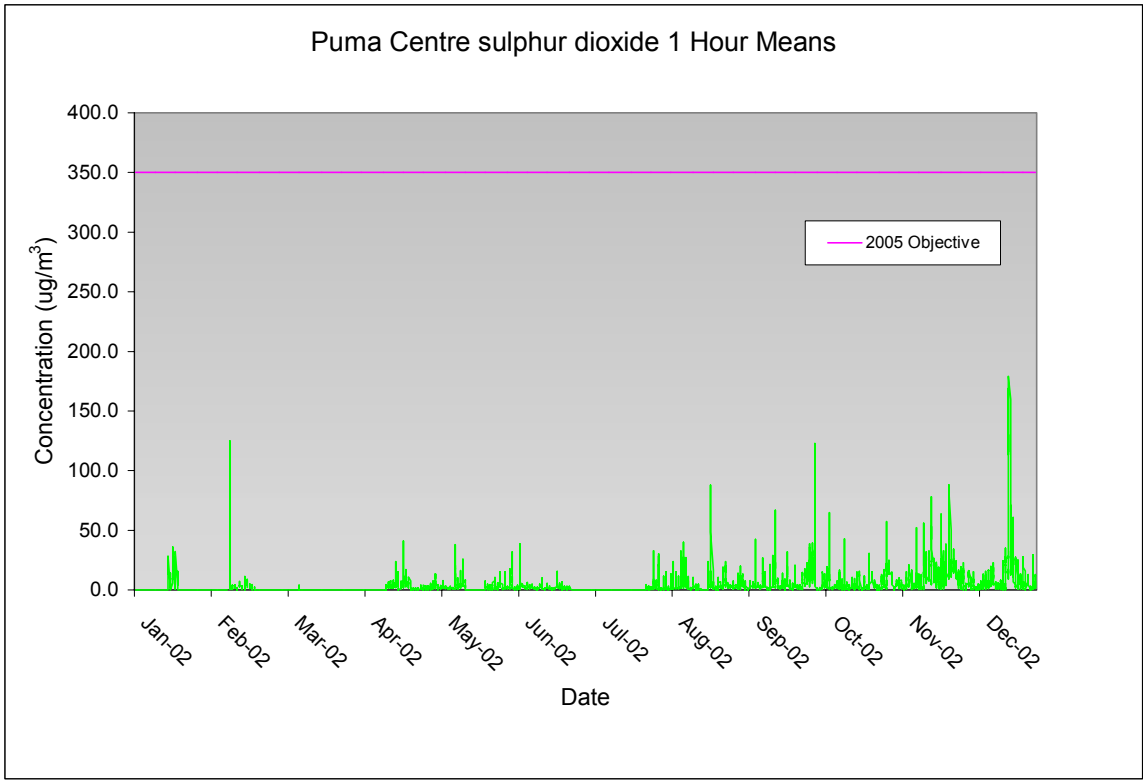


Figure 6.5

B Monitoring Data (inside an AQMA)

- Not Applicable to City of Sunderland

C New industrial Sources

- There are no new industrial sources within or around the City of Sunderland, therefore there is no requirement to consider these sources any further**.**

D Industrial Sources with substantially increased emissions

- None of the sources identified during the 1st round as potentially significant have substantially increased emissions

E Areas of Domestic Coal Burning

- Since April 1995, Smoke Control Orders have been in place throughout the City of Sunderland meaning smokeless fuel has replaced coal burning. The number of properties using smokeless fuel has declined rapidly as residents have switched to natural gas as a fuel source.
- There are no areas within the City of Sunderland where significant smokeless fuel burning takes place and therefore no need to consider these sources further.

F Small Boilers > 5MW (thermal)

- **Identify all boiler plant > 5MW that burn coal or fuel oil**
  Since the last round of R & A there has been one other new boiler plant greater than 5MW identified. It consists of two 9956kW boilers situated at The Sunderland Paper Mill, Hendon. This is a Part A1 process which undertakes paper, pulp and board manufacturing activity. The boilers are normally run on natural gas but the supply is interruptible and medium fuel oil is used during the periods of interruption. In 1997, 184 tonnes of fuel oil were used but this amount has decreased and in 2000 62 tonnes were used and 0 tonnes in 2001. The decrease in use has been attributed to the gas supply becoming more reliable. Regulations have limited the sulphur content of fuel oil to less than 1 % since 1st January 2003, and this together with the very irregular use of the fuel oil has led to the conclusion that this source will not be significant.

G Shipping

- There are 700 ship movements per year into and out of the Wear this is below the stated threshold of 5000 and therefore there is no requirement to assess the potential Sulphur Dioxide from this source.

H Railway Locomotives

- Two train operators were identified in the Sunderland area. These were Arriva, who operate a passenger service, and EWS who run freight trains. After discussions with representatives of both Arriva and EWS it was concluded that at no time would diesel locomotives be stationary

for more than 15 minutes. Both companies stated that it was company policy not to allow their train engines to idle for more than 15 minutes.

7.2 Conclusion

- Monitoring data has demonstrated that all statutory objectives are predicted to be met for the 2004 and the 2005 objective. Industrial and transport sources have been screened and do not need further assessment. City of Sunderland has therefore decided not to proceed to a detailed review and assessment of sulphur dioxide.

Updating and Screening Assessment for PM_{10}

Objective: 24 hour mean of 50μg/m^3 not to be exceeded more than 35 times a year by 2004
Annual mean of 40μg/m^3 by 2004

8.0 Introduction

The APEG[1] report has confirmed that PM_{10} sources can be divided into 3 main categories. Primary particle emissions are derived directly from combustion sources, including road traffic, power generation and industrial processes. Secondary particles are formed by chemical reactions in the atmosphere, and comprise principally of sulphates and nitrates. Coarse particles comprise of emissions from a wide range of sources, including resuspended dusts from road traffic, construction works, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles. The focus of LAQM is on control of emissions at a local level.

The City of Sunderland together with the other Tyne & Wear authorities proceeded to a 2nd & 3rd Stage R & A of sulphur dioxide after identifying significant sources during the 1st Stage R & A. The 3rd Stage R & A concluded that results from monitoring data, an emission inventory and atmospheric dispersion modelling had predicted that all statutory objectives would be met for PM_{10} and therefore no further action was required.

City of Sunderland have continued to assess PM_{10} concentrations since the last round of R & A and this information together with any pertinent long term data is presented under the following headings:

8.1 Updating and Screening Assessment

A Monitoring Data (outside an AQMA)

- Continuous monitoring of PM_{10} has been carried out at two sites using TEOM samplers within the City of Sunderland. Trimdon Street site is a kerbside site situated on a 5-arm junction in the city centre. Puma Centre, Silksworth is an urban background site. See Appendix 2 for detailed monitoring site descriptions.

  Table 7.1 provides a summary of PM^{10} monitoring carried out since the last round of R&A. The Trimdon Street site shows considerably higher values than the Puma Centre site. The increased emissions can be attributed to the position of the two sites. Large volumes of traffic pass the Trimdon Street site whereas the Puma Centre site is in a site only near minor roads.

[1] APEG (1999) *Source apportionment of airborne particulate matter in the United Kingdom*. Report of the Airborne Particles Expert Group.

Table 7.1

Site	Year	No. of exceedences of hourly objective	Maximum 24-hour average recorded	Annual Average	Data Capture %
Trimdon Street	2001	16	76.1	30.55	94.3
Trimdon Street	2002	12	73.5	28.1	79.5
Puma Centre	2002	2	55.4	18.1	79.5

Figures 7.2 and 7.3 show Trimdon Street and Puma Centre sites data.

Figure 7.2

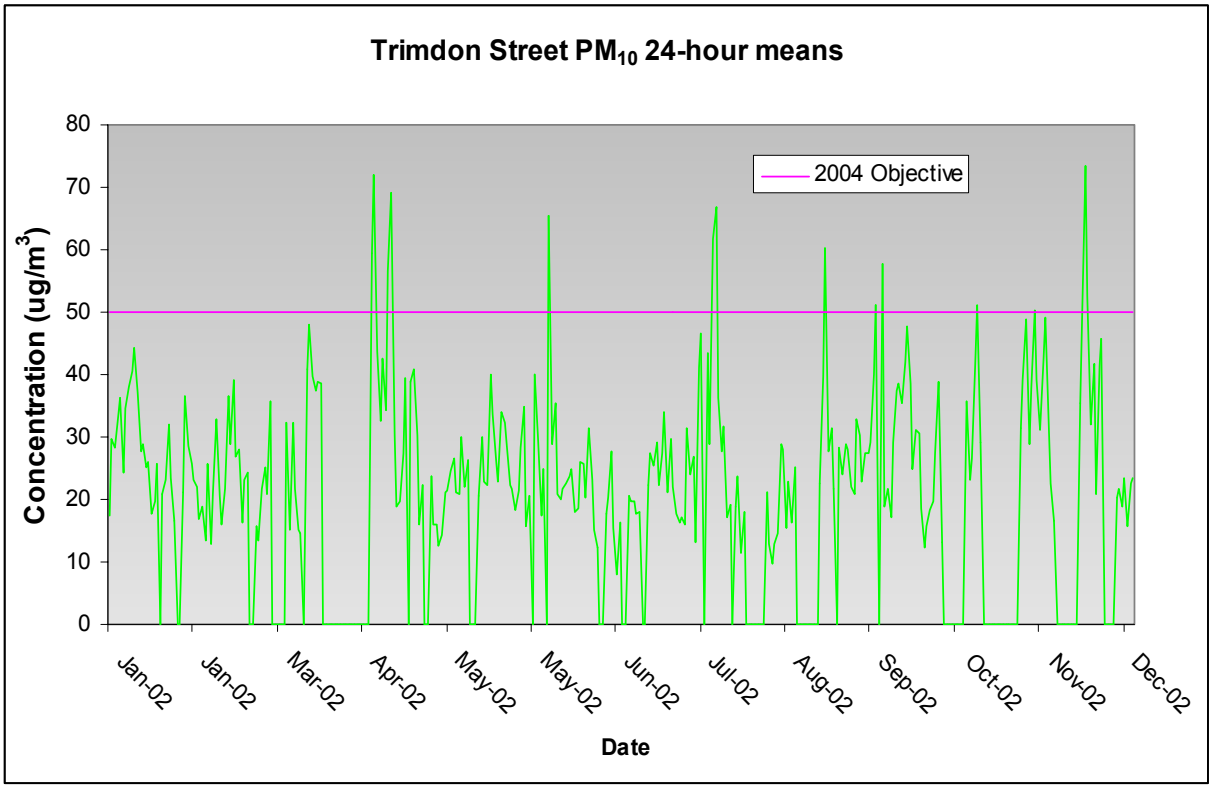
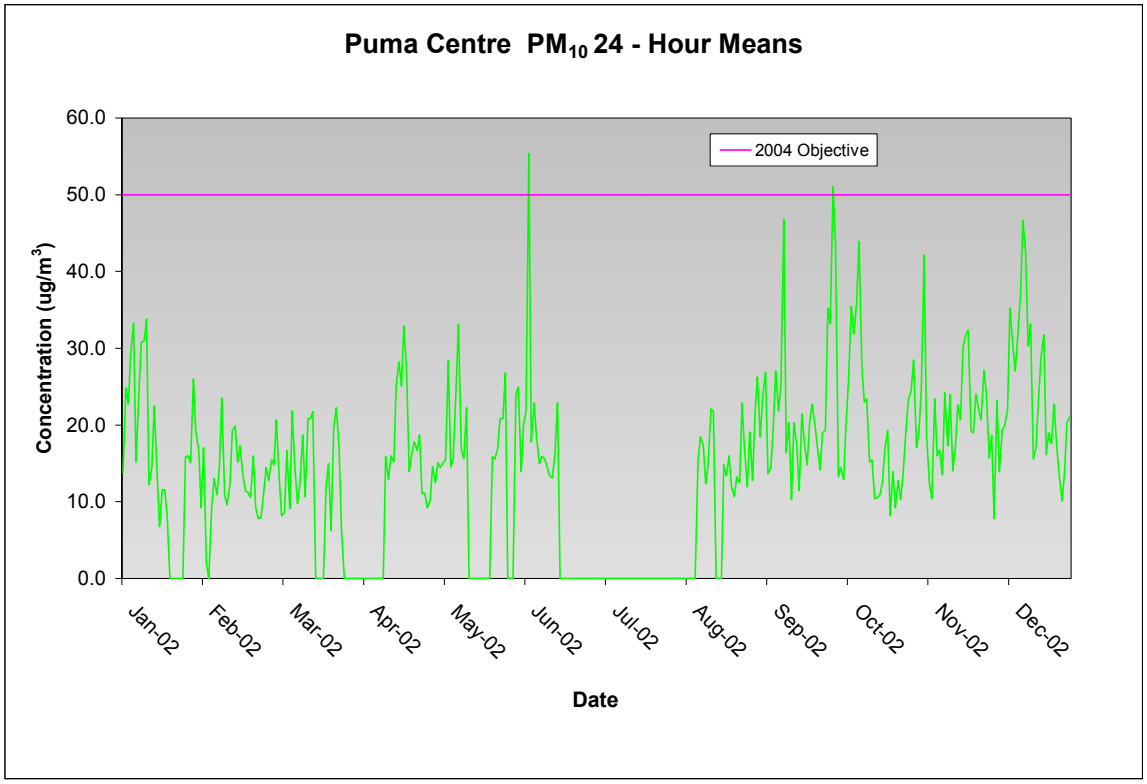


Figure 7.3



Future predictions of PM_{10} have been calculated for comparison with the 2004 and 2010 objectives using the guidance set down in LAQM (TG03). Table 7.4 shows the results of the calculations. Data from 2002 was used for both site's calculations and the 90th percentile was calculated as there was less than 90% data capture at both sites.

Table 7.4

Site	Predicted Year	Annual Mean	90th %ile	Estimated no. of exceedances
Trimdon St	2004	27.3	48.9	18/19
Trimdon St	2010	25.0	44.8	12/13
Puma Centre	2004	17.7	31.7	1/2
Puma Centre	2010	16.7	29.9	0/1

The results show that predicted levels of PM_{10} for 2004 should meet both the annual mean and 24-hour mean objectives. The predicted levels for 2010 have also been calculated to compare against the provisional objective. The results show that the provisional objectives will be met at the Puma Centre site but not at the Trimdon Street site.

Therefore it is not necessary to proceed to a detailed R & A on the basis of monitoring data.

B Monitoring Data (inside an AQMA)

- Not Applicable to City of Sunderland

C Busy Roads and junctions in Scotland

- Not Applicable to City of Sunderland

D Junctions

- Junctions identified as having flows of greater than 10,000 vehicles have been modelled using DMRB and the results can be seen in Appendix 1. There are no junctions which exceed the objectives for particulate matter for the year 2005.
-

E Roads with high flow of buses/ HGVs

- There are roads with high flow of buses and/or HGV'S and the information gathered is presented in Appendix 1 together with DMRB.

F New roads constructed or proposed since 1st round.

- There has been one major new road proposed since the last round of R & A within the City of Sunderland. The Southern Radial Route has been identified as having a possible effect on local air quality. An Environmental Impact Assessment has been undertaken within which an air quality assessment was included. The results did not predict any exceedences of the objectives at relevant locations so there is no need to proceed further on the basis of new roads constructed or proposed.

G Roads close to the objective during the first round of Review & Assessment

- There are no roads within the City of Sunderland where more than 30 24-hour exceedences of 50$\mu g/m^3$ were predicted in relevant locations in 2004, during the 1st round of Review and Assessment.

H Roads with significantly changed traffic flows

- There are no roads within the City of Sunderland with more than 10,000 vehicles per day that have experienced 'large' increases in traffic.

I New industrial Sources

- There are three new industrial sources have the capacity to emit significant quantities of particulate matter which within the City of Sunderland,

A Thompson & Sons	Mobile Crusher	The Parade, Hendon
Alex Smiles	Mobile Crusher	Wellington Lane, Deptford
Eppleton Quarry	Coal	Downs Pit Lane, Hetton-le-Hole
Biffa Waste Services Ltd	Landfill Site	Houghton–le–Spring Quarry

- Assessment of both mobile crushers (although both are held permanently on fixed sites) indicates no relevant exposure as both are located in areas industrial where long term exposure by residents is unlikely.

- Eppleton Quarry has a part B coal handling process on site as part of reclamation works. The process is 407 metres from the nearest relevant exposure however the PM_{10} background is 17,7µg/m^3 therefore there is no need to proceed to a detailed assessment. In addition the scheme is expected to be completed by 2005.

- Biffa Waste Services have applied for a PPC Permit for a Landfill Site in Houghton-le-Spring Quarry. The nearest residential property is 360 metres from the process boundary and the background PM_{10} concentration is 18.6µg/m^3 and does not meet the criteria as 'near'. Particulate matter was taken into consideration under a Nuisance and Health Risk Assessment in the PPC Permit Application. This assessment states that any dust on the site will be non-hazardous or inert and will be controlled by operating and handling procedures and environmental controls.

J Industrial Sources with substantially increased emissions

- None of the sources identified during the 1st round of R & A as potentially significant have 'substantially' increased emissions.

K Areas of Domestic Solid Fuel Burning

- Since April 1995, Smoke Control Orders have been in place throughout the City of Sunderland meaning smokeless fuel has replaced coal burning. The number of properties using smokeless fuel has declined rapidly as residents have switched to natural gas as a fuel source.
- There are no areas within the City of Sunderland where significant solid fuel burning takes place and therefore no need to consider these sources further.

L Fugitive Sources

- Table 7.5 below, shows fugitive sources that have been considered.

Process	Distance to relevant receptor (m)	Estimated 2004 annual mean background ($\mu g/m^3$)
Stockpiles of Aggregate in Port Area	558	18.8
Instrip Demolition, Mobile Crusher	411	18.8
Rocktop Waste Management, Mobile Crusher	205	19
Tarmac Northern, Bulk Cement Process (City Centre)	90	31.9
Tarmac Northern, Bulk Cement Process (Springwell)	151	18.9
RMC, Bulk Cement Process	157	20.3
Hanson, Bulk Cement Process (Washington)	168	19.1
Hanson, Bulk Cement Process (Houghton –le-Spring)	232	18.6

- It must be established whether there is relevant exposure 'near' to the sources of dust emission. LAQM. TG (03) defines 'near' within 1000m if the estimated 2004 annual mean background is greater to or equal to 27$\mu g/m^3$, within 400m if the 2004 background if greater or equal to 26$\mu g/m^3$, and within 200m if 2004 background is <26 $\mu g/m^3$. Using these criteria it can be established that two of the above processes have relevant exposure. These are Tarmac Northern situated in Trimdon Street, Sunderland and RMC situated in Pottery Row, Sunderland. Both are Bulk cement processes and are authorised under Local Authority Control as Part B processes.

- LAQM.TG(03) states that to proceed to a detailed assessment for fugitive emissions there must be relevant exposure *and* dust concerns associated with the facility.
  Dust complaints had previously been received regarding the RMC site from nearby call centre offices. City of Sunderland investigated and found the complaint to be justified. The situation was remedied by the installation of an enclosure and atomising water sprays around the discharge hopper by the operator. City of Sunderland are now satisfied that there are no dust concerns
  City of Sunderland has received no complaints from residents regarding Tarmac Northern, Trimdon Street and Part B process

inspections have not indicated any significant dust problems at the site. Therefore they will not proceed to a detailed assessment for fugitive emissions of PM_{10}.

8.2 Conclusion

Monitoring data has demonstrated that all statutory objectives are predicted to be met for the 2004 objective. Industrial transport and fugitive sources have been screened and do not need further assessment. City of Sunderland has therefore decided not to proceed to a detailed review and assessment of PM_{10} at this stage. However, it is likely that City of Sunderland will need to proceed to a detailed review and assessment when the 2010 objective comes into force.

Conclusion

Following this updating and screening assessment the City of Sunderland is to carry out a detailed assessment of Nitrogen Dioxide levels over the next twelve months. The results of this detailed assessment will be collated and submitted to DEFRA with an accompanying decision as to whether the Air Quality Objectives for Nitrogen Dioxide will be met in the City and whether it will be necessary to declare an Air Quality Management Area in the City Centre.

In addition monitoring will take place at relevant locations and will be reported in a progress report regarding benzene levels in the vicinity of combined road and industrial sources.

Particulate monitoring will continue throughout the City in preparation for the reduction of the Air Quality Objective for PM_{10} in 2010.

Appendix 1

A. DMRB Methodology & Results

DMRB

The DMRB screening model (v1.01) was used to screen roads identified in the Updating and Screening checklist for nitrogen dioxide and PM_{10}.

Data on annual average traffic flow (AADT), average speeds, the proportion of different vehicle types, the type of road, and the distance from the centre of the road to the receptor. Background concentrations for the relevant future year were also inputted.

The DMRB model predicts the annual mean concentration for direct comparison with the annual mean objectives. The results are shown in the table below in descending order for predicted nitrogen dioxide concentration.

The sites chosen to be modelled by DMRB were defined by the checklists in LAQM. TG(03). These were;

- Narrow congested streets with residential properties close to the kerb
- Junctions
- Busy streets where people may spend 1-hour or more close to traffic
- Roads with high flow of buses and/or HGV's

As much information as possible was gathered before using DMRB. However, it was not possible to model every scenario that would fall into the categories above due to availability of traffic data. The worst-case scenarios of each category were identified using a combination of actual data and local knowledge and have been modelled. It is therefore assumed that concentrations of pollutants at locations not modelled would be less than those that have been modelled.

DMRB Results Table

Receptor Name	Year	Annual NO_2 ug/m^3	PM_{10} ug/m^3	Days >50 ug/m^3	Road Name
Chaplin's P.H., Stockton Rd	2005	41.21			Stockton Rd/ Durham Rd/ St Michaels Rd roundabout
Chaplin's P.H., Stockton Rd	2004		27.07	17.87	Stockton Rd/ Durham Rd/ St Michaels Rd roundabout
1 Rose Street	2005	37.2			Trimdon St/ Sillsworth Row/ Hylton Rd roundabout
1 Rose Street	2004		25.6	13.88	Trimdon St/ Sillsworth Row/ Hylton Rd roundabout
235 Chester Road	2005	37.13			Chester Rd/ Kayll Rd/ Ormonde St junction
235 Chester Road	2004		25.54	13.73	Chester Rd/ Kayll Rd/ Ormonde St junction
259 Chester Road	2005	36.8			Chester Rd/ Kayll Rd/ Ormonde St junction
259 Chester Road	2004		25.48	13.57	Chester Rd/ Kayll Rd/ Ormonde St junction
26 Alice Street	2005	34.96			Stockton Rd / Cowan Terrace junction
26 Alice Street	2004		23.81	9.72	Stockton Rd / Cowan Terrace junction
University Crèche	2005	34.83			Chester Rd / Saint Michaels Way junction
University Crèche	2004		23.95	10.03	Chester Rd / Saint Michaels Way junction
Park Lane Shopping Area	2005	34.26			Park Lane adjacent to Bus Station
Park Lane Shopping Area	2004		22.83	7.78	Park Lane adjacent to Bus Station

Receptor Name	Year	Annual NO_2 $\mu g/m^3$	PM_{10} $\mu g/m^3$	Days >50 μg	Road Name
Stewarts Court	2005	34.18			Success Road/ A182 junction
Stewarts Court	2004		23.2	8.48	Success Road/ A182 junction
556 Hylton Road	2005	34.08			Hylton Road/ Saint Lukes Road junction
556 Hylton Road	2004		23.38	8.85	Hylton Road/ Saint Lukes Road junction
2 Thompson Road	2005	33.04			Newcastle Road/ Thompson Road Junction
2 Thompson Road	2004		23.27	8.62	Newcastle Road/ Thompson Road Junction
Corner House P.H.	2005	33.02			High Street/ West Wear Street/ Sans St roundabout
Corner House P.H.	2004		22.52	7.2	High Street/ West Wear Street/ Sans St roundabout
4 Thompson Road	2005	32.7			Newcastle Road/ Thompson Road Junction
4 Thompson Road	2004		23.06	8.21	Newcastle Road/ Thompson Road Junction
91 Raleigh Road	2005	32.32			North Hylton Rd/Castletown Way Junction
91 Raleigh Road	2004		22.19	6.63	North Hylton Rd/Castletown Way Junction
4 Elstob Cottages	2005	31.84			Silksworth Lane
4 Elstob Cottages	2004		22.13	6.53	Silksworth Lane
Savannah P.H., Vine Place	2005	31.71			Vine Place
Savannah P.H., Vine Place	2004		21.5	5.49	Vine Place
76 Hetton Road	2005	31.34			Hetton Road/ Regent Street junction
76 Hetton Road	2004		21.65	5.73	Hetton Road/ Regent Street junction
1 Charlton Road	2005	31.33			Newcastle Road/ Thompson Road Junction
1 Charlton Road	2004		22.24	6.72	Newcastle Road/ Thompson Road Junction
Cairnside South	2005	30.53			Durham Road
Cairnside South	2004		21.47	5.45	Durham Road
1 Barras Drive	2005	30.45			Silksworth Lane/ Essen Way/Premier Rd roundabout
1 Barras Drive	2004		21.36	5.28	Silksworth Lane/ Essen Way/Premier Rd roundabout
36 Statley Gardens	2005	30.29			Essen Way/ Tunstall Rd/ Leechmere Rd roundabout
36 Statley Gardens	2004		21.34	5.24	Essen Way/ Tunstall Rd/ Leechmere Rd roundabout
Houghton Road	2005	30.24			Houghton Road
Houghton Road	2004		20.94	4.65	Houghton Road
92 Queen Alexandra Rd	2005	29.66			Queen Alexandra Road/ Ashbrooke Range junction
92 Queen Alexandra Rd	2004		21.08	4.86	Queen Alexandra Road/ Ashbrooke Range junction

All situations modelled with DMRB were predicted to meet the objective for PM_{10} for both the annual objective and the number of days above 50 $\mu g/m^3$. The highest annual mean predicted was 27.07$\mu g/m^3$.

The NO_2 annual objective is predicted to be breached at one site – Chaplin's Public House. This receptor is situated alone in the city centre and has residents living in it permanently. It is also close to the bus station and has roads running either side of it, which carry almost exclusively buses and coaches.

There are also several sites that have annual means that approach the objective for NO_2 but do not reach it, with concentrations of approximately 36 and 37$\mu g/m^3$. These sites along with the one site that does breach the

objective will be investigated in a detailed review and assessment of nitrogen dioxide.

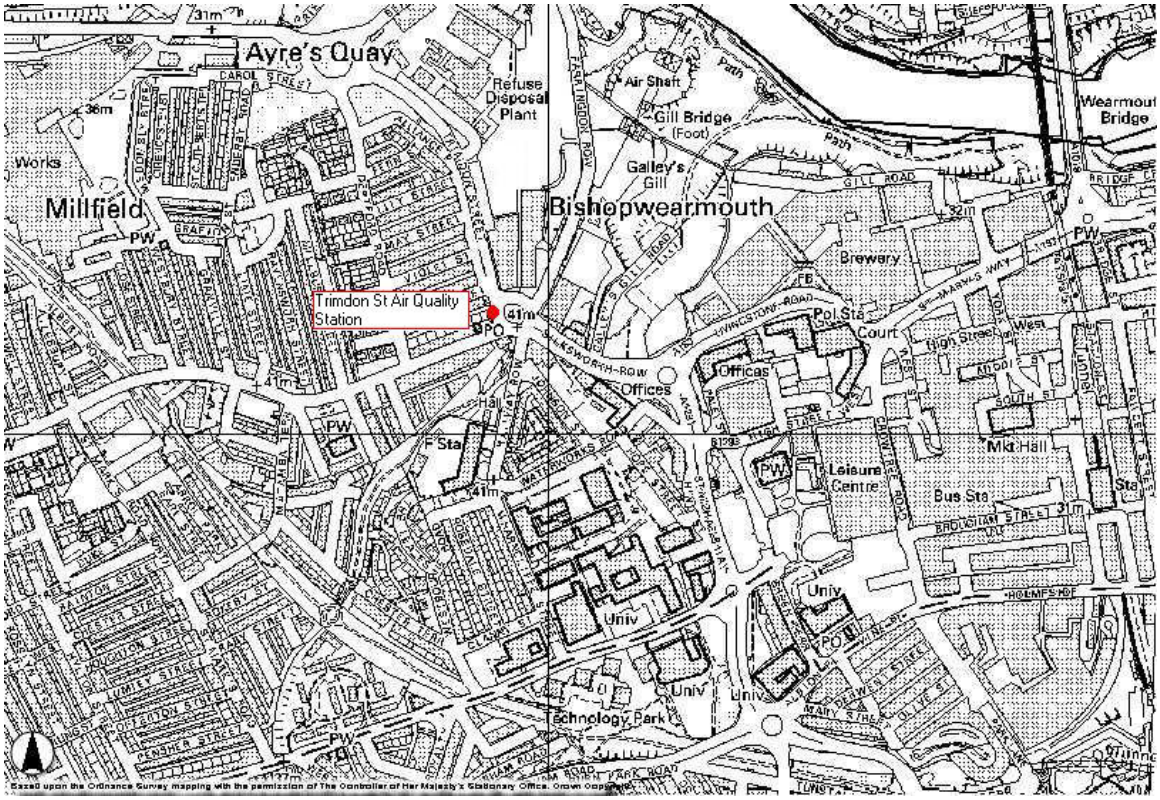
Appendix 2

Monitoring Site Descriptions

Automatic Monitoring Stations Site Description

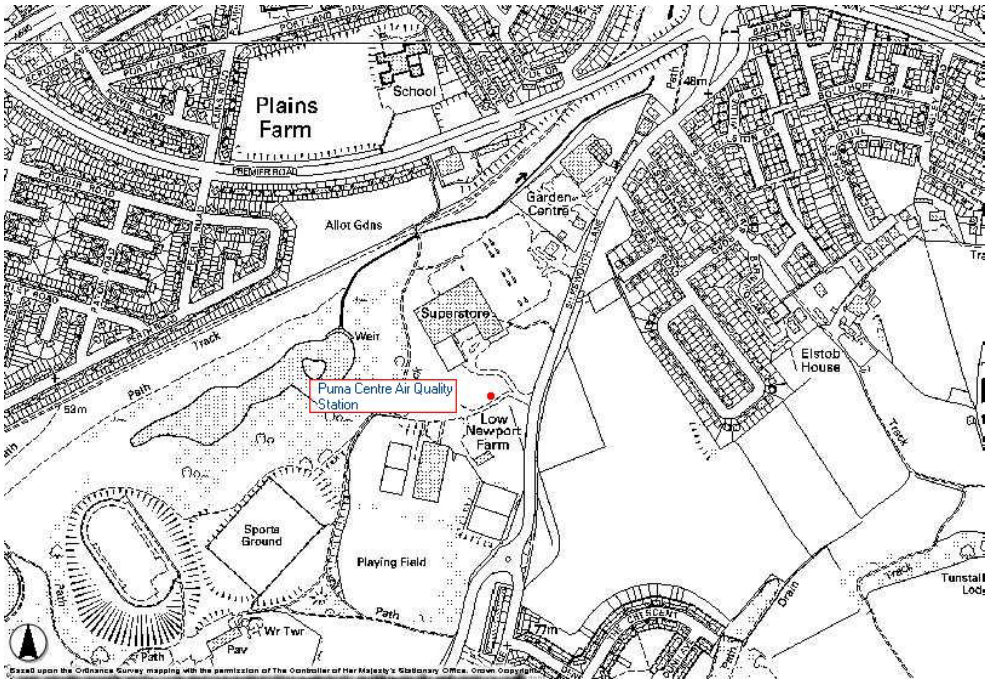
Trimdon Street Station

Trimdon Street Air Quality Station is a kerbside site on a busy 5-arm roundabout in the city centre. It can be classified as a Kerbside (U1) site according to LAQM (TG03) and is 0.5m from the edge of the road. Traffic Flow past the station on the major link (Silksworth Row to Trimdon Street) is approximately 26,000 AADT. There are also two additional traffic links on the roundabout that have an AADT of 10,555 and 1,160. The station has been in place since Sept 2000 and measures NO_x, PM_{10}, and Wind Speed & Direction.



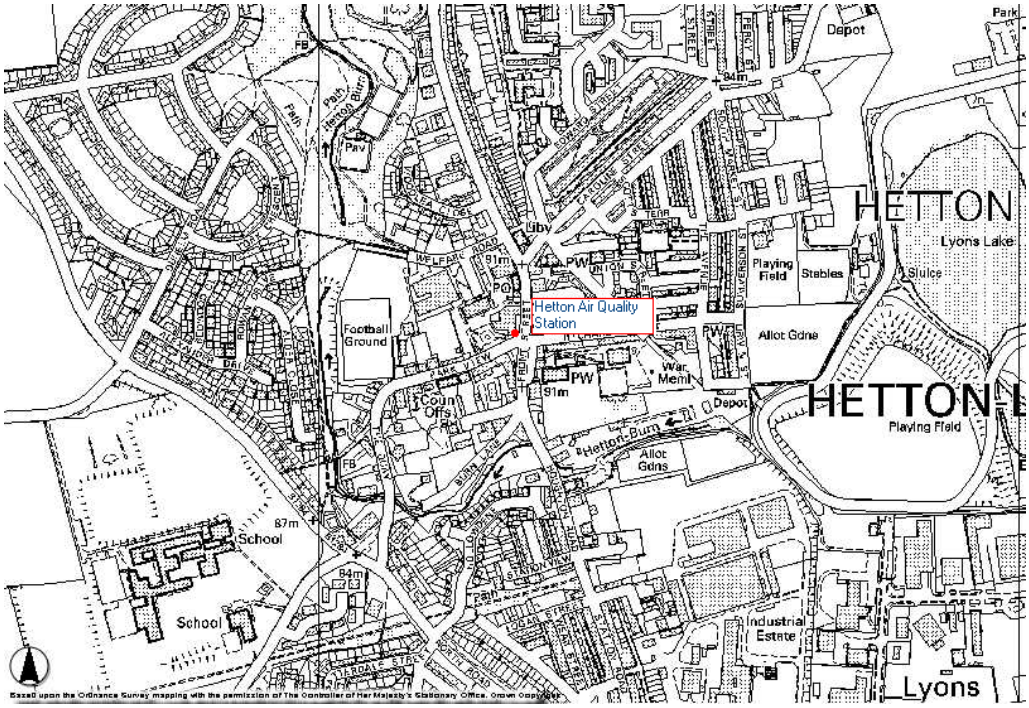
Puma Centre Station

The Puma Centre Air Quality station is situated in the grounds of the Silksworth Sports Complex on the sports centre access road adjacent to Silksworth Lane. It can be classified as an Urban Background site (U4) according to LAQM TG (03). Traffic flows on Silksworth Lane, which is the closest 'busy' road, are approx. 12,000 AADT
The station has been in place since September 2001 and measures NO_x, PM_{10}, SO_2, CO, and Wind Speed & Direction.



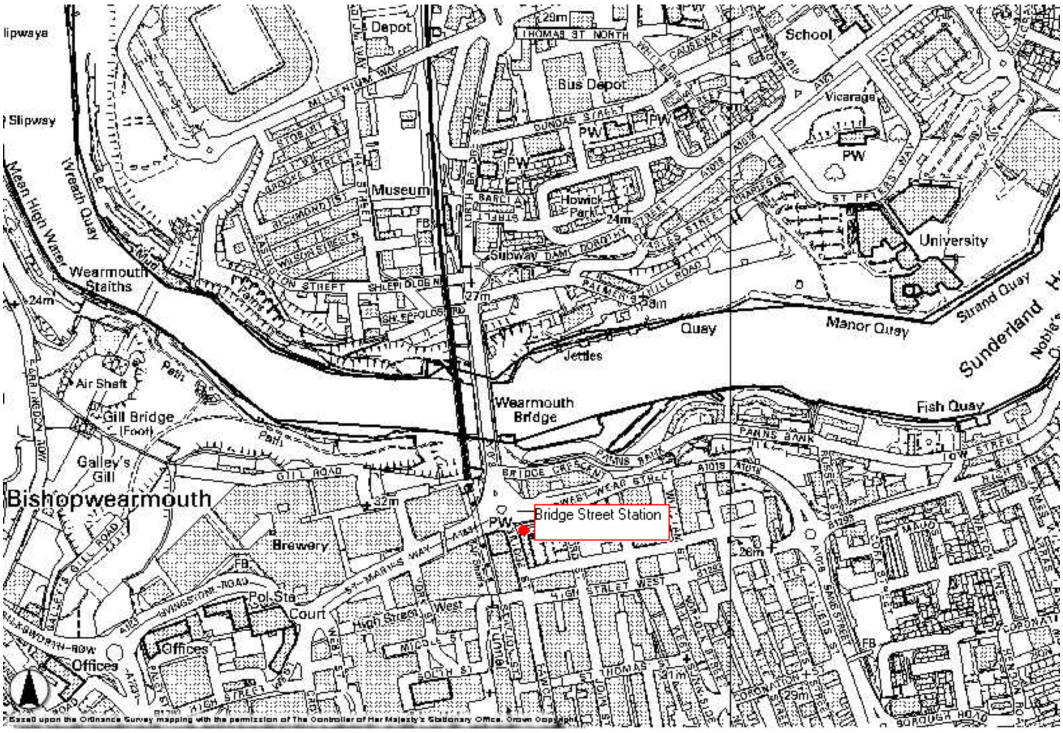
Hetton-le-Hole

This site was monitored for 8 months between June 2001 and Feb 2002. The air quality station used is shared between the local authorities of the Tyne & Wear Air Quality Group and each authority receives the station for approximately 6 months each in turn. The site is in the main road through Hetton–le-Hole on a busy roundabout. It can be classified as a Kerbside (U1) site according to LAQM TG (03). The station measures NO_x, PM_{10}, SO_2 and CO.



Bridge Street

Like the Hetton-le-Hole site, the shared air quality station also monitored this site. The site can be classed as a roadside (U2) site according to LAQM TG (03) and was situated near a busy roundabout at the south side of the Wearmouth Bridge. Traffic flows across the bridge are 38264 AADT. The site was monitored from July 1998 to March 1999 and measured NO_x, PM_{10}, SO_2 and CO.



City of Sunderland Nitrogen Dioxide Diffusion Tube Sites 2001-2002

Tube No.	Site Address	Back ground or Roadside	Grid Reference	
			Easting	Northing
24	3 Rothley, Fatfield, Washington	R	431568	554800
29	Arndale House, St Mary's Way	R	439508	557151
34	209 Newcastle Road, Fulwell	R	439266	559212
38	17 Parkside South, East Herrington	B	435714	552473
39	15 John Street, Central	R	439835	556978
41	The Golden Lion, Lion Place, South Hylton	B	434997	556811
53	166 Chester Road, Millfield	R	438568	556566
55	25 Eden Vale, Thornholme	R	438690	556135
56	101 Southwick Road, Southwick	B	439101	558282
57	5/6 Northbridge Street, Monkwearmouth	R	439664	557829
58	6 Beatrice Terrace, Shiney Row	R	432634	552616
67	39 Ferryboat Lane, Hylton Castle	R	432634	552616
76	8 Burn Hope Road, Barmston, Washington	B	431705	556786
77	31 Mendip Drive, Lambton, Washington	R	430040	555002
78	Highfield Hotel, 101 Durham Rd East Rainton	R	433338	547848
80	Dame Dorothy Primary School, Monkwearmouth	B	440178	557937
81	47 Howick Park, Monkwearmouth	R	439690	557638
82	20 Marlborough Road, Hastings Hill	R	435097	555166
83	The Wavendon, Wavendon Cres, High Barnes	R	437009	555802
84	B.P.Filling Station, Wessington Way	R	435664	557816
85	North Moor Housing Office, Nth Moor Lane	R	437043	554207
86	2 Alice Street, Thornholme	R	439466	556484
87	Dicken's Street, Southwick	R	438095	558354
88	Hind's Street, Central	R	439160	556995
93	34A Durham Road, Middle Herrington	R	436290	553566
94	8 Vine Place Central	R	439423	556738
100	Air Quality Station, Trimdon Street	R	438928	557151
101	Puma Centre, Silksworth Lane	B	438116	554462
102	Lamppost, AQ Station, Station Road, Hetton	R	435278	547463

Appendix 3

QA/QC

QA/QC of Diffusion Tubes

Laboratory Accreditation

City of Sunderland diffusion tubes are supplied and analysed by Gradko International Ltd, Winchester, Hampshire.
Gradko has full U.K.A.S. accreditation for compliance with ISO-IEC 17025 for laboratory management system. Its accuracy and consistency of analytical methods is regularly monitored using external proficiency schemes such as

- Workplace analysis scheme for proficiency (W.A.S.P.)
- Laboratory Environmental Analysis Proficiency (L.E.A.P.)

In addition regular cross-checks are carried out with other U.K.A.S. accredited labs using certified standard solutions.

Nitrogen Dioxide Diffusion Tube Procedure

This procedure used in City of Sunderland is identical to the UK NO_2 Diffusion Tube Network procedure produced by AEA Technology for DEFRA.

- The calendar year is divided into 12 ‘pollution months’, which contain either 4 or 5 weeks for which the tubes will be exposed.
- Change over occurs on a Tuesday to avoid bank holidays. Every effort is made to change tubes on the specified date but if this is not possible then tubes are changed $\pm$ 2 days.
- Tubes are stored in airtight bags in a refrigerator until used.
- A ‘blank’ control tube is left in the refrigerator during the exposure period and not exposed.
- Tubes are labelled with a unique ID number.
- Tubes are transported to site in snap seal bags.
- At each site the date and time of start of the exposure period is recorded and with the absorbent end cap uppermost, the bottom cap is removed and the tube is clipped into the holder.
- The tube is mounted vertically with its open end downwards.
- At the end of the exposure period tubes are removed and end cap replaced. The date and time are recorded.
- The tubes are then transported back to the office and refrigerated in an airtight bag until they are sent to the lab for analysis which is as soon as possible.

Benzene Diffusion Tube Procedure using

- Tubes are exposed for the same periods as nitrogen dioxide tubes.
- Tubes are stored in airtight bags at room temperature in a clean environment.
- A ‘travel blank’ is left at the office and not exposed.
- Tubes are not labelled directly but put into individually labelled snap seal bags and transported to site.
- Caps (marked with a red spot) are removed using a spanner and a diffuser cap is placed on the tube in its place.

- The tube is mounted vertically with diffuser cap facing downwards and the date and time recorded.
- At the end of the exposure period the diffuser cap is removed and the brass cap is put back onto the tube making sure the bottom of the PTFE seal is in-line with the groove on the tube.
- The cap is tightened with a spanner and tube placed in labelled snap seal bag. The date and time are recorded.
- Caps should be retightened with spanner in case of temperature change when returning to the office.
- Tubes are sent to lab for analysis as soon as possible.

B. QA/QC of Continuous Analysers

The QA/QC procedures of City of Sunderland are based on the AUN Site Operator's manual along with training received from our equipment suppliers, EMC who are part of the Casella Group (formerly ETI).

The fundamental aims of a quality assurance/ control programme are:

- The data obtained from measurement systems should be representative of ambient concentrations existing in each area.
- Measurements must be accurate, precise and traceable.
- Data must be comparable and reproducible.
- Results must be consistent over time.
- An appropriate level of data capture is required throughout the year.

Equipment Maintenance

- Automatic analysers are serviced every 6 months by a qualified engineer under a contract with EMC.
- Local Authority staff visits the air quality sites at least once every 2 weeks during which a check of the equipment is made to ensure it is all working within normal parameters. Filters are also changed during this visit.
- If a problem occurs then a call-out is instigated to the service centre and an engineer will normally visit site within 2-3 days to correct the fault

Calibration

- Each day a calibration response check is undertaken by the logger, this check does not re-calibrate the instrument. The calibration system uses certified gas cylinders of a known concentration, to produce an expected response from the analyser.
- Calibration reports stored in the logger will retain expected zero and span gas responses and the actual measured zero and span gas responses.

- Enview software collects and stores these calibration reports and also calculates a zero correction and span response scaling factor which can be applied to the data if required.
- At the 6-month service the instruments are re-calibrated to the site cylinder certificated value.
- Gas cylinder pressures are regularly checked at routine visits to ensure they are replaced before they run out completely.
- When a cylinder is replaced the new certified values are entered into the logger.

Data Validation

- Data is reviewed daily to ensure that

  - Telecommunications to the station are operational
  - The air quality station is operational
  - Individual analysers are operational
  - Air quality exceedences are identified
  - Operational information such as TEOM filter loading, does not invalidate data
  - Obvious data errors are identified

Data Ratification

In addition to the initial data screening process (validation), data are further scrutinised in monthly blocks in order to provide a final ratified data set.

The Enview software has been set up to automatically rescale the data using the factor calculated from the daily calibration check so there is no requirement to rescale the data set.
Data is then reviewed for erroneous data such as:

- Daily calibration spikes
- Routine or service visit errors
- Analyser faults
- Site faults, such as power outages

When data is satisfactory, it is compared to other local sites. This provides a check to ensure data is realistic.