



Part IV of the Environment Act 1995 Local Air Quality Management

Perth and Kinross

**Air Quality Review and Assessment
Progress Report**

April 2005

Executive Summary

The Government introduced a system for Local Air Quality Management (LAQM) through the Environment Act 1995. This established the requirement for all authorities to execute the periodic review and assessment¹ of air quality in accordance with the Air Quality Regulations 1997, 2000 and 2002, relative to the standards and objectives² detailed within the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2). In this way, local authorities were afforded the flexibility to address air quality through localised planning and strategies in order to deliver the national objectives.

In accordance with these requirements Perth and Kinross Council began the second cycle of Review and Assessment with an Updating and Screening Assessment (USA) which, when published in 2003, identified nitrogen dioxide and small particulate matter as pollutants at risk of exceeding the objective levels. A Detailed Assessment of these pollutants was subsequently initiated, and, although these findings have yet to be published, Perth and Kinross Council will be required to declare an Air Quality Management Area, undertake a Further Assessment and prepare an Action Plan for both pollutants.

Since the last Updating and Screening Report of 2003 found that the 2005 annual average objective for nitrogen dioxide was likely to be exceeded near busy junctions and street canyons, the diffusion tube sampling network for NO₂ was expanded accordingly. Although the resultant Detailed Assessment has yet to be published, both it and this Progress Report confirm the USA conclusions. The USA and the Detailed Assessment also found that both the 2010 annual average and the 2004 and 2010 24 hour mean PM₁₀ objectives may not be met near busy road junctions in Perth. However, this Progress Report indicates that 2004 data for the operational automatic monitoring site does not breach the 2004 objectives.

These findings are to be considered in the context of the pending Detailed Assessment recommendations. This data will also be incorporated into the Further Assessment.

Perth and Kinross Council has identified no new development with significant adverse effects upon local air quality.

¹ As illustrated by LAQM.TG(03) Box 1.3: Timetable for review and assessment (3)

² As described within LAQM.TG(03) Table 1.1: Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (3)

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Introduction

Legislative Background

The Government introduced a system for Local Air Quality Management (LAQM) through the Environment Act 1995. This established the requirement for all authorities to execute the periodic review and assessment³ of air quality in accordance with the Air Quality Regulations 1997, 2000 and 2002, relative to the standards and objectives⁴ detailed within the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (1). In this way, local authorities were afforded the flexibility to address air quality through localised planning and strategies in order to deliver the national objectives.

LAQM in Perth and Kinross

In accordance with these requirements and relevant guidance Perth and Kinross Council began the second cycle of Review and Assessment with an Updating and Screening Assessment which, when published in April 2003, identified nitrogen dioxide and small particulate matter as pollutants at risk of exceeding the objective levels (2)(3). A Detailed Assessment of these pollutants was subsequently initiated, and, although these findings have yet to be published, Perth and Kinross Council will be required to declare an Air Quality Management Area, undertake a Further Assessment and prepare an Action Plan for both pollutants.

Progress Report

As part of the LAQM regime all local authorities are required to submit a Progress Report in 2005, primarily in order to create continuity in the reporting of LAQM implementation. Perth and Kinross Council have collated data from an array of monitoring sites and other sources in respect of these duties and here provide an update of air quality issues in Perth and Kinross.

³ As illustrated by LAQM.TG(03) Box 1.3: Timetable for review and assessment (3)

⁴ As described within LAQM.TG(03) Table 1.1: Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (3)

Chapter 1 – New Monitoring Data

1.1 Monitoring in Perth and Kinross

Perth and Kinross Council utilises two automated stations within Perth which provide air quality monitoring data⁵. Each site samples and records the continuous, real-time concentrations of nitrogen dioxide (NO₂) and small particulate matter (PM₁₀).

Technical difficulties experienced at the Atholl Street monitor during 2004 resulted in a diminished level of data capture for both pollutants. This situation has since been rectified and data gathered from 1 October 2004 onwards.

The Council maintains an extensive network of diffusion tube sites⁶ in order to monitor the concentrations of nitrogen dioxide throughout Perth and Kinross.

Perth and Kinross Council has an ongoing commitment to quality assurance and quality control, and accordingly ensure that all measurements fully comply with the recommendations of the air quality review and assessment guidance.

1.1.1 Diffusion Tube Preparation and Analysis

The NO₂ diffusion tubes are provided and analysed by Dundee City Council Scientific Services. This laboratory takes part in and meets QA/QC Field Intercomparison standards specified for the National NO₂ Network. Preparation utilises a 20% v/v triethanolamine (TEA) in water methodology and analysis via colorimetric techniques typically follows four week exposure periods.

1.1.2 NETCEN Ratification

All automatic monitoring data has been collected, ratified and supplied by Netcen. Netcen ensure monitoring instrumentation, methodologies and data conform to consistent and traceable national and international standards. This includes full measurement traceability through the use of UKAS-accredited calibration gases.

1.2 Nitrogen Dioxide (NO₂)

1.2.1 Objective

*By 31 December 2005: 200 micrograms per cubic metre or less, when expressed as an hourly mean, not to be exceeded more than 18 times within any year **and** 40 micrograms per cubic metre or less, when expressed as an annual mean*

1.2.2 Automated Monitoring Data

Data collected from the High Street monitor corresponds to the period 1 Jan – 31 Dec 2004 while Atholl Street data for the period 1 Oct – 31 Dec 2004 is

⁵ See Appendix I for location maps of all automatic monitoring stations

⁶ See Appendix I for location maps of all diffusion tube sites

included for completeness. Variation in hourly mean concentrations over time is presented in Figures A3.1 and A3.2. NO₂ data are summarised below.

Parameter	Automated NO ₂ Monitoring		
	Objective	Measured	Exceedences
High Street			
Hourly Mean	200 µg m ⁻³	124 µg m ⁻³ (max)	0
Annual Mean	40 µg m ⁻³	28 µg m ⁻³	0
Data Capture		94.3%	
Atholl Street			
Hourly Mean	200 µg m ⁻³	195 µg m ⁻³ (max)	0
Period Mean ⁷	NA	59 µg m ⁻³	NA
Data Capture		91.7%	

1.2.3 Diffusion Tube Monitoring Data

Diffusion tube data for 2004 has been treated in accordance with the necessary guidance⁸, using a statistical tool created by Netcen⁹ and provided by SEPA. This assists in the calculation of precision and accuracy of collocation studies, and the adjustment of diffusion tube results using the bias adjustment calculated.

In line with guidance, due to the good precision of the collocation study and the few factors reported for the same laboratory, the locally derived adjustment factor has been applied (4).

The adjusted results are presented in Figure A3.3, and fully tabulated in Appendix 2, alongside the raw data, projected concentrations and percentage variation in data between 2003/4.

1.2.4 Discussion

The results presented in Section 1.2.2 show that neither of the objective levels were exceeded at the High Street automatic monitoring station during 2004. As this automatic monitoring site has only been in operation since June 2003 it is not possible to make meaningful assessment of trends in annual data levels. It was, however, observed from the Detailed Assessment that the annual mean (extrapolated) for 2003 was 29.7 µg m⁻³ and is comparable to that measured in 2004. Further, it is considered prudent to refrain from commenting in relation to the maximum hourly mean as such short-period measurements are the subject of particular variation and would be again limited in validity by the timescale of site operation. However, cursory assessment implies a degree of seasonality within this dataset.

The period mean measured at the Atholl Street automatic monitor has been manipulated in accordance with the guidance¹⁰ to provide an estimated

⁷ Parameter expressed as a period mean (not annual mean) as the monitoring programme yielded data from 1 October to 31 December 2004 only.

⁸ As described within LAQM.TG(03) Boxes 6.3, 6.4 and Annex 1 (3)

⁹ DT_PrecisionAccuracyBias (Beta 3 – Feb 2004) spreadsheet

¹⁰ As described in LAQM.TG(03) Box A1.3 Estimation of annual mean from short period surveys (3)

annual mean concentration of $40 \mu\text{g m}^{-3}$. This level is shown to be somewhat lower than that of proximate diffusion tube sites. This could be considered to be an underestimation due to the use of background sites (as prescribed) within the calculation methodology.

The 2004 annual nitrogen dioxide diffusion tube results are summarised and presented in Figure A3.2, with equivalent data for 2003 also shown. These indicate an overall change of +22 to -7 % across all sites in 2004, with several sites previously indicated to be marginally within the annual objective level now recording exceedence (2). These newly exceeding sites are located in geographical proximity to both each other and those sites registering exceedence for 2003. Projected concentrations for 2005 indicate that a diminished number of these sites are likely to breach the annual objective level. Consequently, these results will be investigated further during the next phase of the Review and Assessment process.

It is observed that, although the annual mean concentrations derived from the chemoluminescence monitoring have remained relatively constant between 2003 and 2004, the bias derived from the diffusion tubes collocated at this site has decreased significantly. This has meant that the adjustment factor applied to raw diffusion tube data has increased by 21%¹¹ to 0.969, thus significantly increasing the number of sites in exceedence of the objective levels. It is observed that another authority have reported a factor of 0.83 for 2004 using the same laboratory, in line with historical adjustment records¹². This suggests that the local collocation derived adjustment factor may be anomalously high and subject to significant annual fluctuation. Continued monitoring will be necessary in order to draw definitive conclusions in this respect. The significance of bias adjustment factors in relation to our diffusion tube data will be considered in the Further Assessment.

1.3 Small Particulate Material (PM₁₀)

1.3.1 Objective¹³

*By 31 December 2010 (2004): 50 micrograms per cubic metre or less, when expressed as a 24 hour mean, not to be exceeded more than 7 (35) times within any year **and** 18 (40) micrograms per cubic metre or less, when expressed as an annual mean.*

1.3.2 Automated Monitoring Data

Data from the High Street monitor corresponds to the period 1 Jan – 31 Dec 2004 while Atholl Street data for the period 1 Oct – 31 Dec 2004 is included for completeness. Variation in hourly mean concentrations over time is presented in Figure A3.1 and A3.2. PM₁₀ data are summarised below.

¹¹ Calculated from adjustment factor extracted from the 2003 PKC Detailed Assessment (unpublished)

¹² <http://www.uwe.ac.uk/aqm/review/diffusiantube280205.xls>

¹³ 2004 objectives are shown within brackets

Automated PM ₁₀ Monitoring			
Parameter	Objective ¹⁴	Measured	Exceedence (hrs)
<u>High Street</u>			
24hr Mean	50 µg m ⁻³	38 µg m ⁻³ (max)	0
Annual Mean	18 (40) µg m ⁻³	13 µg m ⁻³	0
Data Capture		98.6%	
<u>Atholl Street</u>			
24hr Mean	50 µg m ⁻³	36 µg m ⁻³ (max)	0
Period Mean ¹⁵	NA	19 µg m ⁻³	NA
Data Capture		94.1%	

1.3.3 Discussion

The maximum daily average concentration recorded at the High Street automatic monitoring station in 2004 was 38 µg m⁻³, with an annual average of 13 µg m⁻³. The results presented in Section 1.3.2 indicate that reported PM₁₀ levels lie within the annual and 24hr objective levels at this site. Similarly, the 24 hour mean objective levels were not breached during the measurement period at Atholl Street. In accordance with available technical guidance, estimation of an annual mean from the period mean reported was not possible at this time due to insufficient data.

It may be misleading at this stage to offer further comment upon current annual trends in PM₁₀ pollution within Perth and Kinross as the timescale of this study is confined to the period since June 2003. In reviewing data from 2003, the Detailed Assessment concluded that there was significant risk of exceedence of objectives for nitrogen dioxide and particulate matter at locations subject to traffic congestion in the centre of Perth.

Further investigation during the next phase of the Review and Assessment process will enhance assessment of the significance of data trends. As part of the Further Assessment, Perth and Kinross Council will also consider the application of particulate speciation analysis to derive source apportionment data for PM₁₀ pollution.

¹⁴ 2004 objectives are shown within brackets

¹⁵ Parameter expressed as a period mean (not annual mean) as the monitoring programme yielded data from 1 October to 31 December 2004 only.

Chapter 2 – New Local Developments

The following information relates to changes which have occurred since May 2003.

2.1 Industrial Processes Affecting Air Quality

The following regulated industrial processes and associated alterations have potential to impact local air quality:

Table 2.1 – Regulated processes affecting LAQ

SEPA Ref.	Process Description	Company and Site Address	Status
APC/E/20204	Petrol Vapour Recovery	Tesco Stores Ltd, Crieff Road, Perth	Revoked
APC/E/545	Fishmeal Storage	CPL Calport, Norsk Store, Friarton Road, Perth	Revoked
APC/E/532	Vehicle Respraying	Macrae & Dick, Riggs Road, Perth	Revoked
PPC/E/30045	Waste Oil Burners Removed	Elder & Paton, Arran Road, Perth	Alteration
PPC/E/30001	Petrol Vapour Recovery	Esso, Broxden, Perth	New
APC/E/120021	Petrol Vapour Recovery	Tesco, Crieff Road, Perth	New
APC/E/120014	Petrol Vapour Recovery	Burrell Street Service Station, Burrell Street, Crieff	New
PPC/E/30086	Cement/Lime	Aggregate Inds., Inveralmond, Perth	New
PPC/E/30094	Crusher	Holdens, The Harbour, Perth	New

2.2 New Industrial, Commercial and Transport Developments

No new industrial or commercial developments are considered likely to have a significant adverse impact upon the local air quality in terms of LAQM.TG(03). Moreover, it is observed from Table 2.1 that several processes have ceased to operate or have been subject to alterations which reduce the potential for negative air quality impacts.

SEPA report that no SEPA regulated processes have increased emissions to air by over 30%.

It is also noted from Table 2.1 that the new petrol stations at Esso (Broxden) and Tesco (Crieff Road) in Perth both have an annual throughput of over

2000m³ of petrol. Consideration of these sites in terms of LAQM.TG(03)¹⁶ indicates that assessment of benzene emissions is not required.

No developments have been approved through the planning system in 2004 that are identified to have significant adverse impact upon air quality by changing local traffic flows. Further, no new roads, road layout alterations or roadworks have been identified as significant.

No new residential or public developments considered significant in terms of air quality exposure or impact have been granted planning approval.

2.3 New Mineral and Landfill Developments

There are no recorded quarries or landfill sites with relevant locations for public exposure within 200m currently operating in Perth and Kinross. However, planning approval has been granted for sand and gravel extraction at Balado. Relevant locations for public exposure are located within 200m of the source, although assessment indicates no significant adverse effects upon local air quality are anticipated when this facility commences operation.

Collace and Friarton quarries have relevant locations within 200-1000m although the background concentrations are less than 16 µg m⁻³ at these sites.

During 2004-05 there have been no recorded complaints of dust from any mineral works or landfill sites in Perth and Kinross.

SEPA have no comment in respect of this issue.

¹⁶ As described within LAQM.TG(03) Box 3.2: Updating and Screening Checklist for assessment of Benzene (3)

Chapter 3 – Additional Information

Perth and Kinross Council has not yet declared an Air Quality Management Area and therefore cannot report progress on implementation of action plans.

Perth and Kinross Council does not monitor ozone, polycyclic aromatic hydrocarbons (PAHs), or any other unregulated air pollutant not previously addressed within this report.

Details of odour complaints, dust deposition, and radiation monitoring are not considered to be part of the statutory LAQM duties of Perth and Kinross Council. However, during 2004 no complaints regarding odour or dust emission from regulated industrial processes were confirmed. Radiation monitoring is not currently executed by Perth and Kinross Council.

There is, as yet, no air quality strategy for Perth and Kinross.

Chapter 4 – Summary of Conclusions and Recommendations

4.1 Conclusions from New Monitoring Data

Since the last Updating and Screening Report of 2003 found that the 2005 annual average objective for nitrogen dioxide was likely to be exceeded near busy junctions and street canyons, the diffusion tube sampling network for NO₂ was expanded accordingly. Although the resultant Detailed Assessment has yet to be published, both it and this Progress Report confirm the USA conclusions.

The USA found that both the 2010 annual average and the 2004 and 2010 24 hour mean PM₁₀ objectives may not be met near busy road junctions in Perth. Although, the Detailed Assessment predicts significant potential for exceedence of the PM₁₀ objectives, this Progress Report indicates that 2004 data for the operational automatic monitoring site does not breach the 2004 objective levels.

4.2 Conclusions from New Local Developments

Perth and Kinross Council has identified no new development with significant adverse effects upon local air quality requiring assessment at this stage.

4.3 Recommendations

It is recommended that these findings are considered in context of the pending Detailed Assessment recommendations. The data upon which this Report is based will also be incorporated into the Further Assessment.

References

(1) DEFRA (2000) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. DEFRA Publications, London, UK.

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(2) Netcen (2003) *Air Quality Updating and Screening Assessment for Perth and Kinross Council*. Perth and Kinross Council.

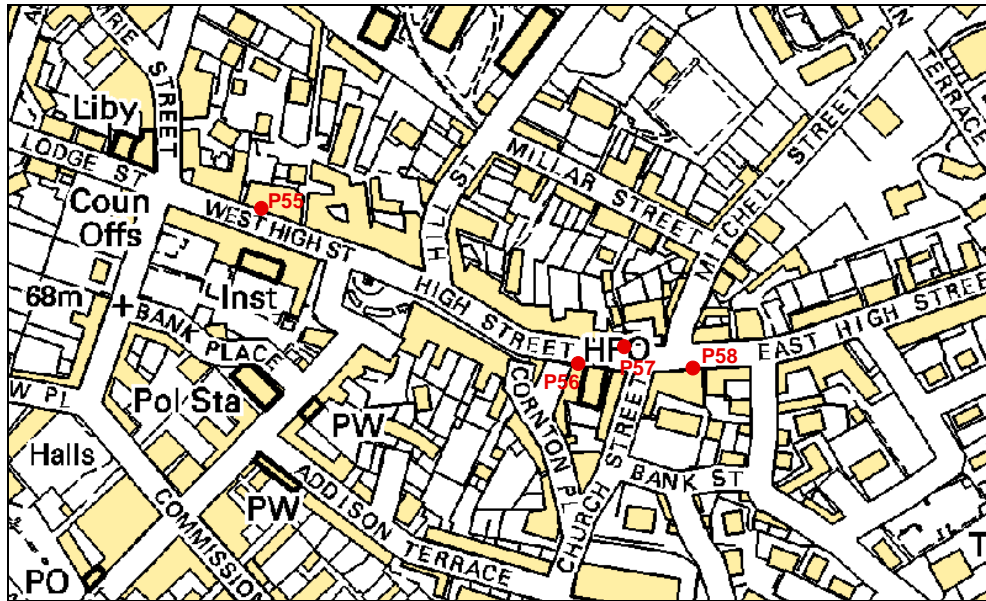
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(3) DEFRA (2003) *Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance LAQM.TG(03)*. DEFRA Publications, London, UK.

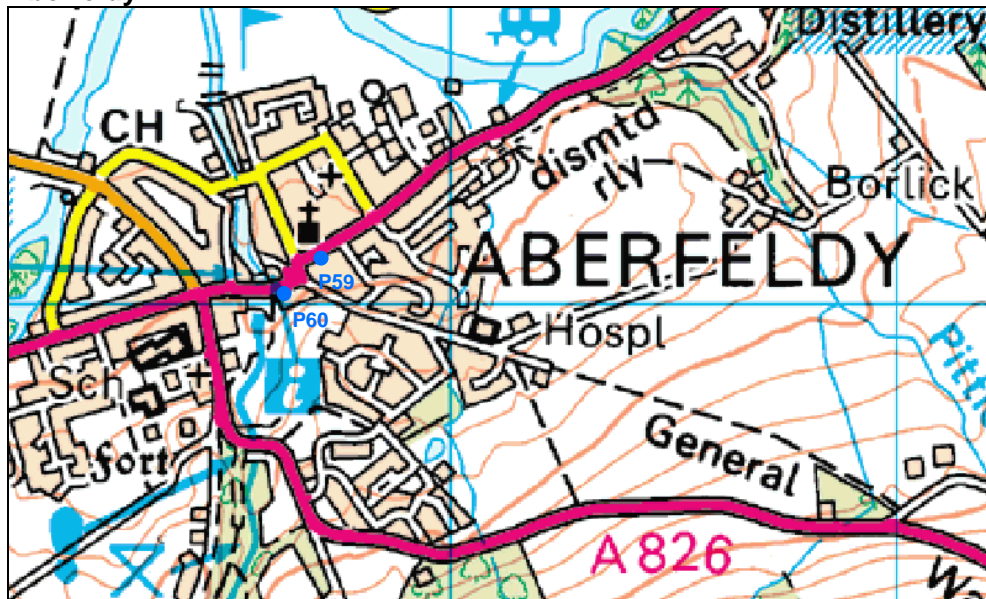
(4) AQM Resource Centre (UWE) (2005, March 22 – last update) *Roads and Nitrogen Dioxide, (Air Quality Review and Assessment Website)*. Available:
<http://www.uwe.ac.uk/aqm/review/mquestions.html#ROADS%20&%20NITROGEN%20DIOXIDE> (Accessed: 2005, March 23).

Appendix I – Monitoring Site Location Maps

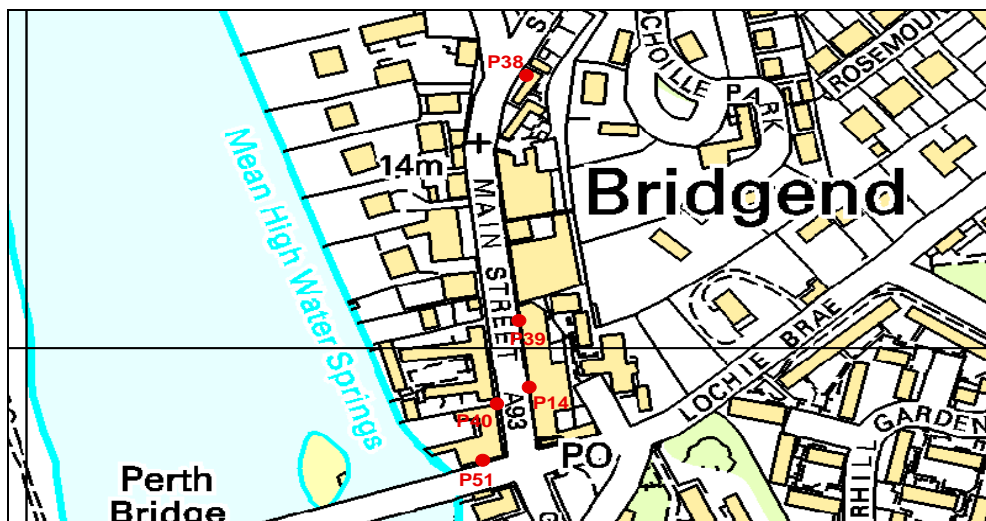
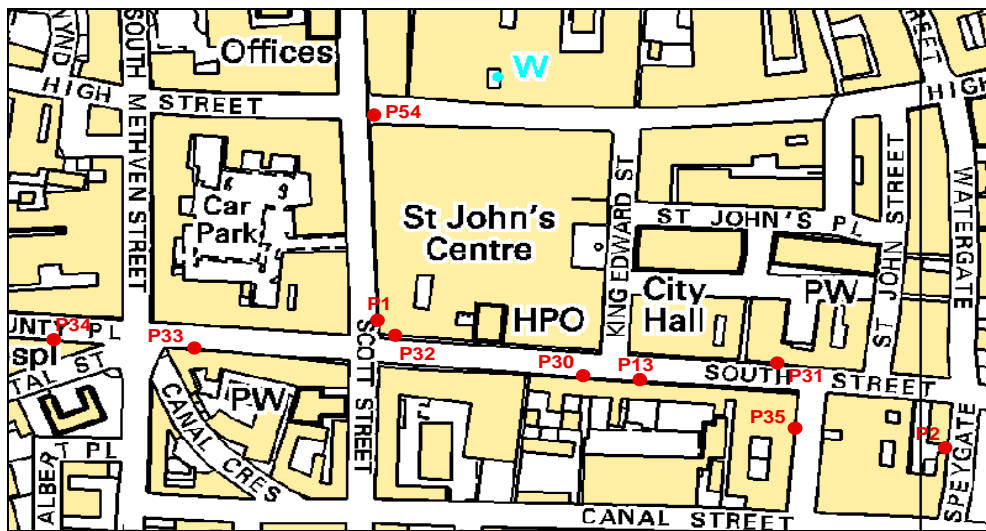
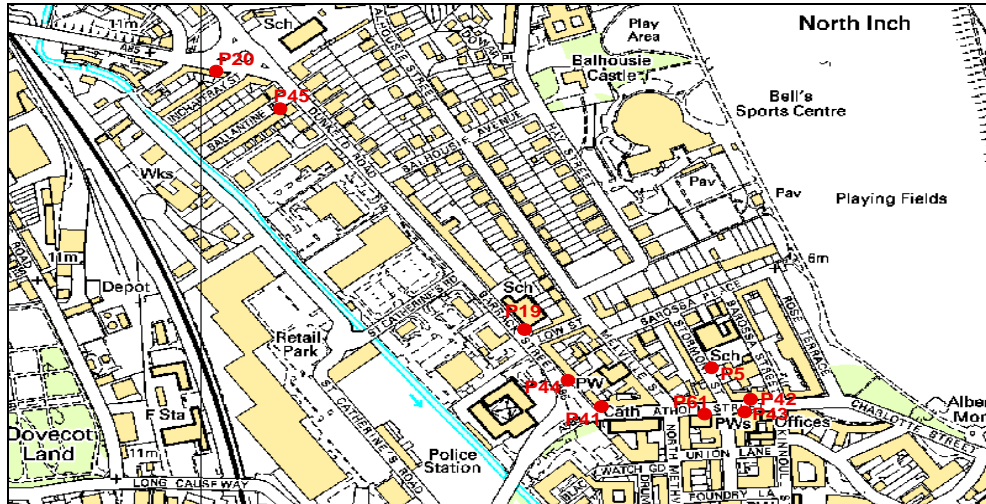
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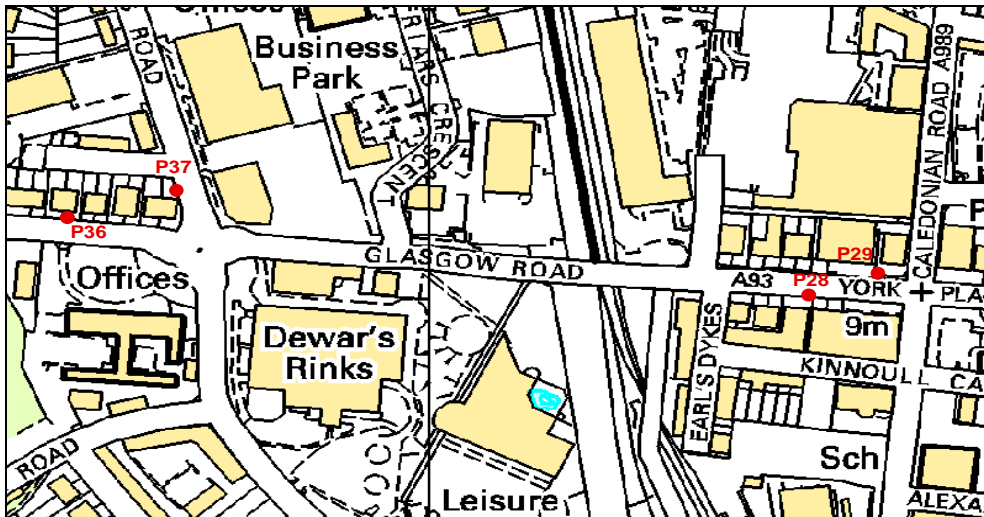
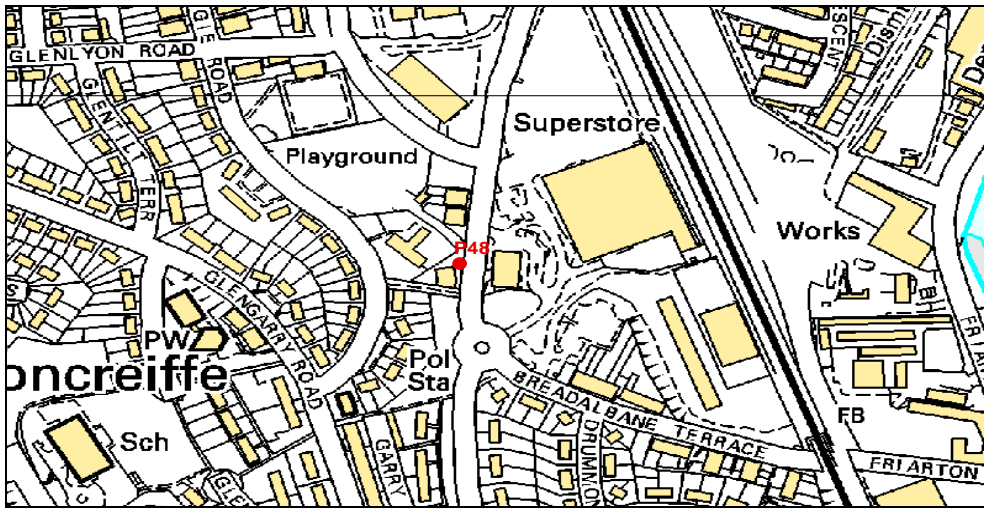
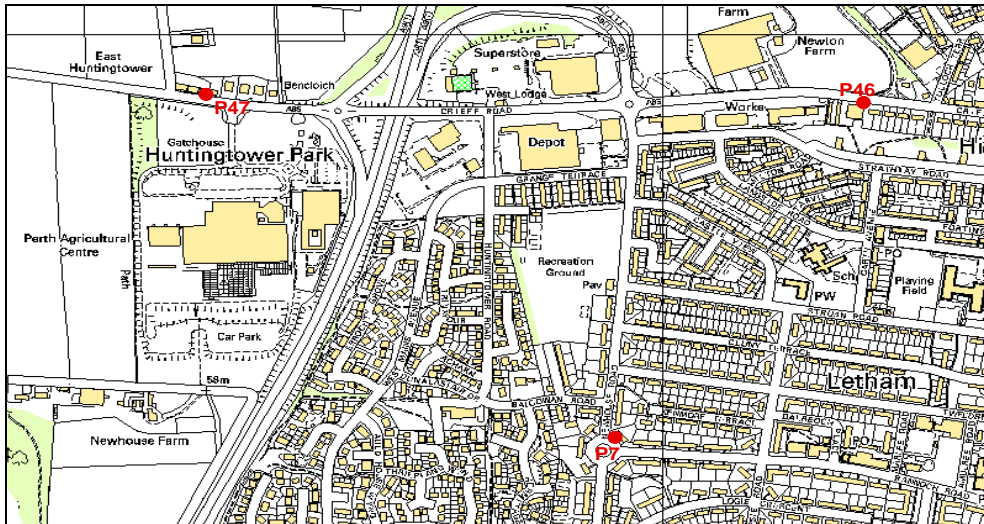


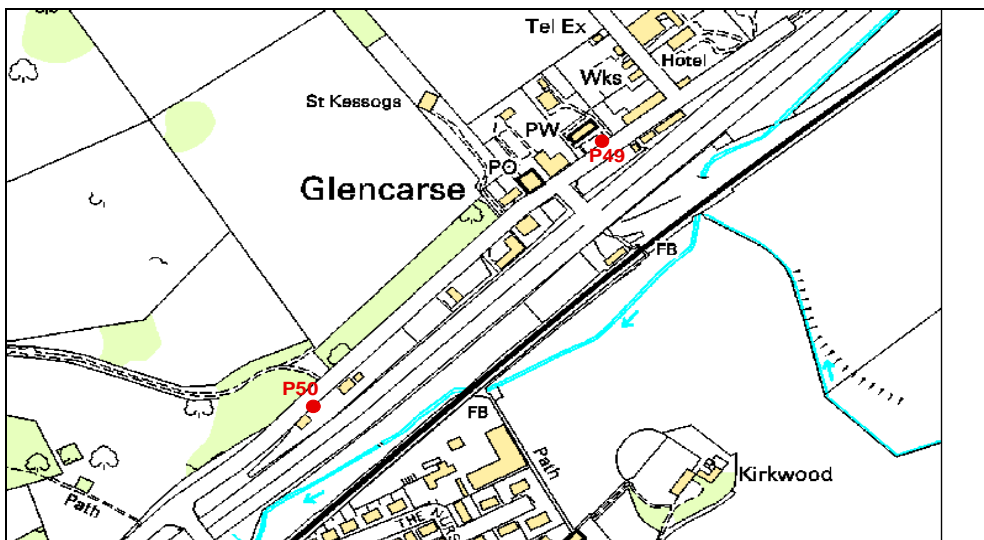
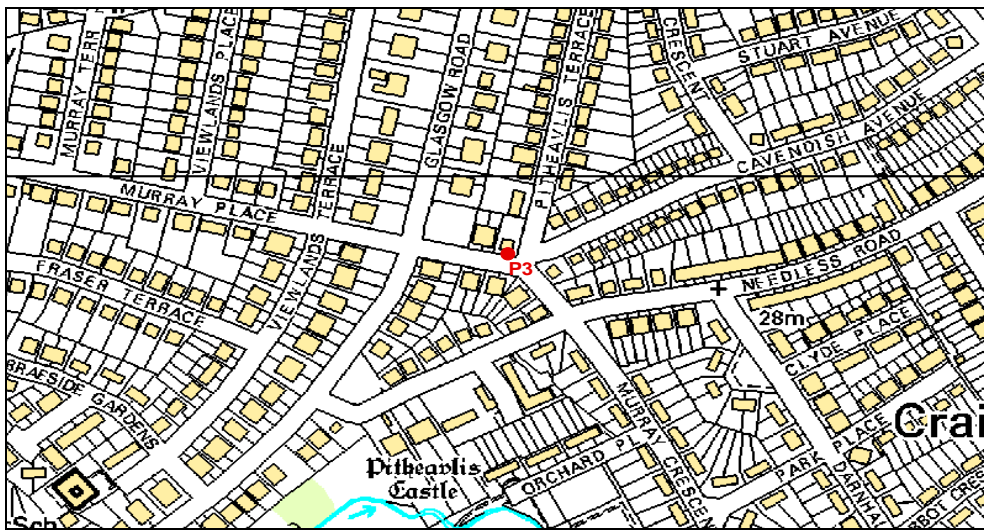
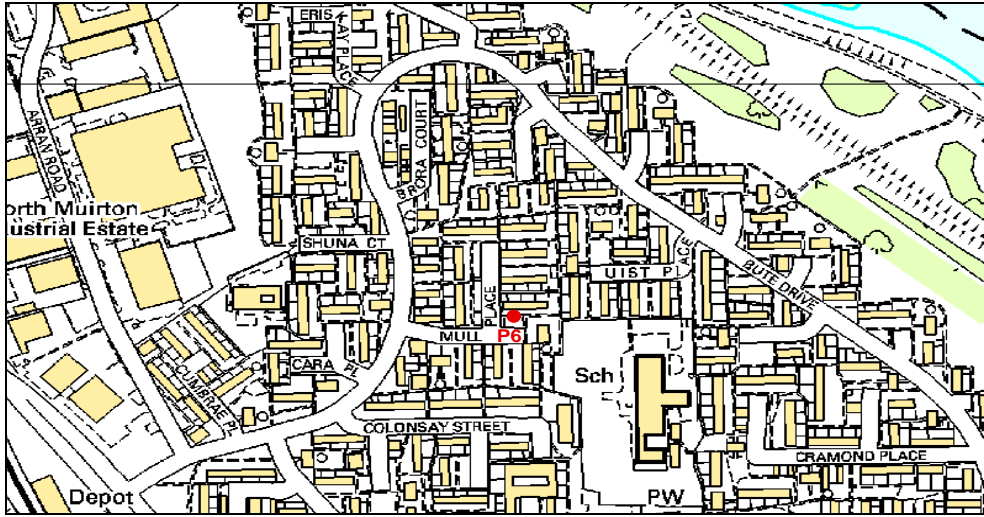
Aberfeldy



Perth







Appendix II – Tabulated Summary Of Diffusion Tube Data¹⁷

Sample Point		2004 All Tube Data			2003 Adj Arithmetic Mean	Change (%) 2003 vs 2004	2005 Projection
		Raw Data	Valid Periods Only				
Address	Ref	Annual Mean	Adj Mean	Error			
42 Scott St, Perth, PH1 5PH	P1	44	42	6	37	14	41
17 Speygate, Perth, PH2 8PJ	P2	26	26	3	22	16	25
15 Murray Cres, Perth, PH2 0HU	P3	20	20	3	19	8	20
8 Stormont St, Perth, PH1 5NW	P5	23	22	3	20	10	21
41 Mull Place, Perth, PH1 3DP	P6	14	13	2	12	10	13
257 Rannoch Rd, Perth, PH1 2DW	P7	18	18	2	18	-1	18
86/88 South Street Perth PH2 8PD	P13	40	39	6	35	11	38
9 Main St, Bridgend, Perth, PH2 7HD	P14	39	38	5	36	7	37
St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	P19	35	34	4	28	22	33
2 Crieff Road Perth PH1 5RT	P20	29	28	4	24	18	27
28 York Place Perth PH2 8EH	P28	42	40	5	36	12	39
37 York Place Perth PH2 8EH	P29	37	36	5	30	19	35
104 South St, Perth, PH2 8PA	P30	43	41	6	35	18	40
45-47 South St, Perth, PH2 8PD	P31	31	30	4	30	1	29
135 South St, Perth, PH2 8PA	P32	36	35	4	32	9	34
216 South Street Perth PH2 8NY	P33	38	37	5	34	8	36
10 County Place, Perth, PH2 8EE	P34	47	45	6	40	13	44
17 Princes St, Perth, PH2 8NG	P35	34	33	4	28	18	32
51 Glasgow Rd, Perth, PH2 0PE	P36	32	31	4	31	1	30

¹⁷ All data are expressed as micrograms per metre cubed (except where stated)

Sample Point		2004 All Tube Data			2003 Adj Arithmetic Mean	Change (%) 2003 vs 2004	2005 Projection
		Raw Data	Valid Periods Only				
Address	Ref	Annual Mean	Adj Mean	Error			
Riggs Rd, Perth, PH1 1PR	P37	33	32	4	26	21	31
93-109 Main St Bridgend, PH2 7HE	P38	31	30	4	28	9	29
39 Main St, Bridgend, PH2 7HD	P39	45	44	6	40	10	43
18 Main St, Bridgend, PH2 7HB	P40	44	43	6	36	19	42
76 Atholl St, Perth, PH1 5NL	P41	50	48	7	43	12	47
26-28 Atholl St, Perth, PH1 6NP	P42	47	45	6	42	8	44
17 Atholl St, Perth, PH1 5NH	P43	51	49	7	44	11	48
22 Barrack St, Perth, PH1 5RD	P44	42	40	6	38	5	39
Ballantine Place, Perth PH1 5RR	P45	25	24	3	22	10	23
204 A Crieff Rd, Perth, PH1 2PE	P46	29	28	4	26	9	27
5 East Huntingtower, Perth, PH1 3JJ	P47	22	22	3	23	-6	21
30 Edinburgh Rd, Perth, PH2 8BX	P48	24	23	3	24	-5	22
Opp Wood'n Garden, Glencarse, PH2 7LX	P49	23	22	3	24	-7	21
Linden Garden Centre, Glencarse, PH2 7LX	P50	24	23	3	25	-6	22
2 West Bridge St, Bridgend, Perth, PH2 7HA	P51	30	29	4	26	10	28
High St Real Time Monitor	P54	30	29	4	27	7	28
7 West High St, Crieff	P55	41	40	5	-	-	39
39, High St, Crieff	P56	35	34	4	-	-	33
The Highland Trading Company, 62, High St, Crieff	P57	31	30	4	-	-	29
9 East High St, Crieff	P58	38	36	5	36	1	35
12 Dunkeld Street, Aberfeldy	P59	27	26	3	-	-	25
Highland Gift Shop, Bridgend, Aberfeldy	P60	19	18	3	-	-	18

Appendix III – Graphical Presentation of New Monitoring Data

Figure A3.1 – Graphical representation of NO₂ and PM₁₀ hourly mean data at High Street automatic monitoring station (1 January to 31 December 2004).

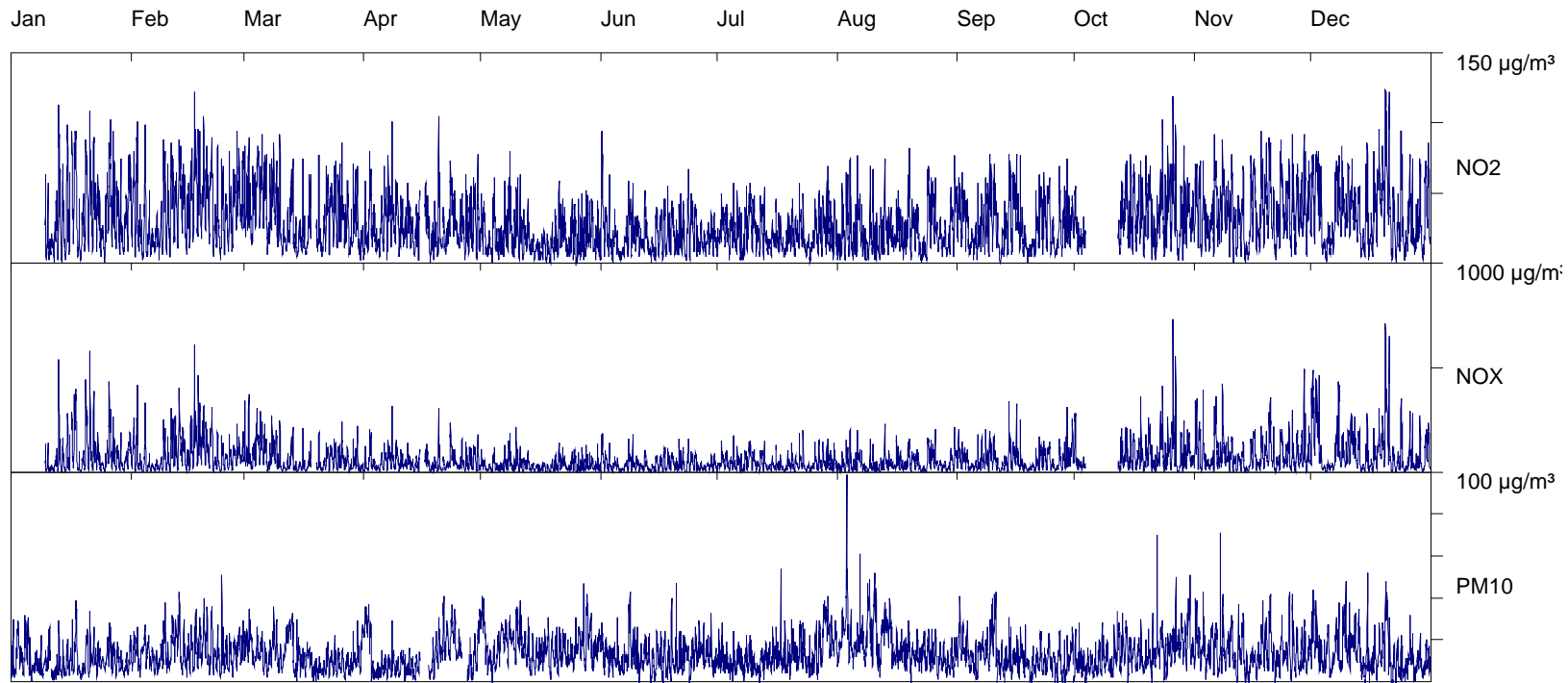


Figure A3.2 – Graphical representation of NO₂ and PM₁₀ hourly mean data at Atholl Street automatic monitoring station (1 October to 31 December 2004).

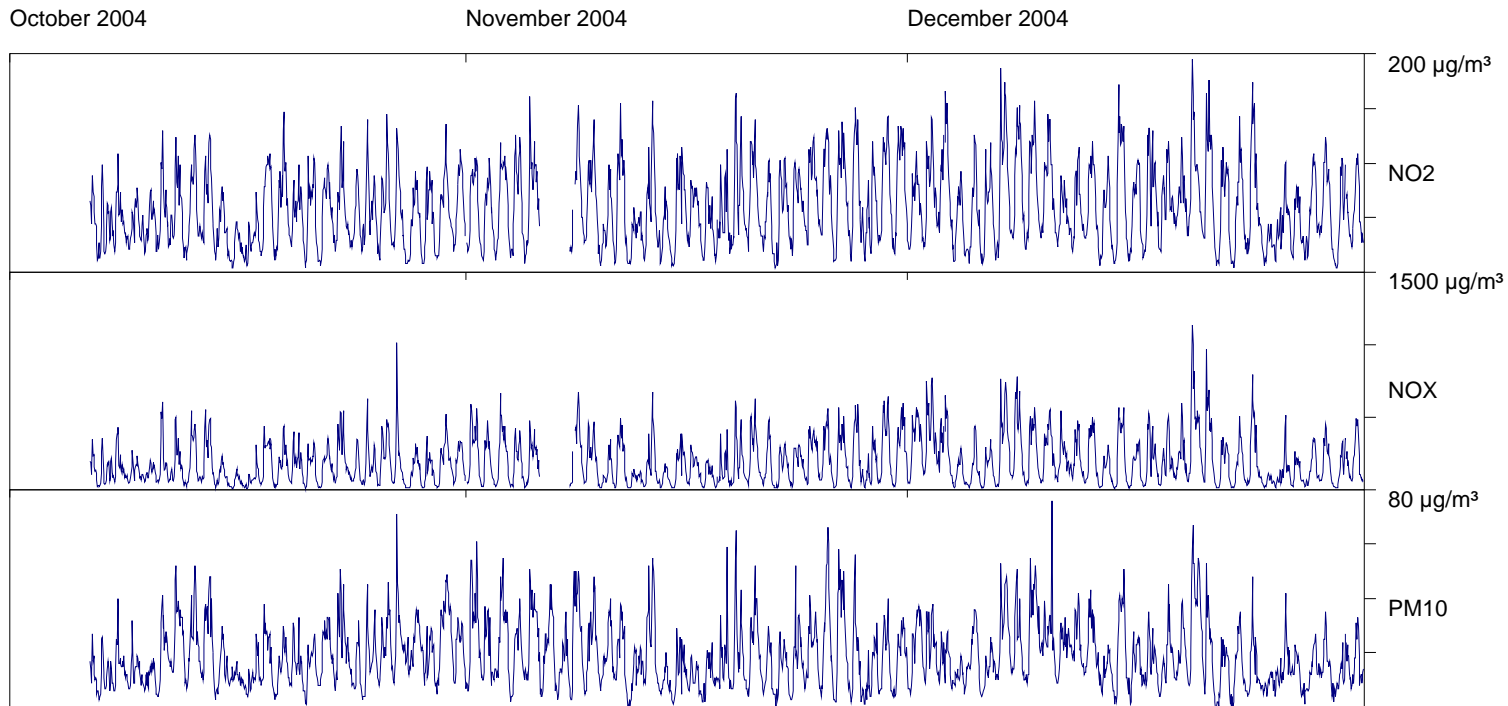
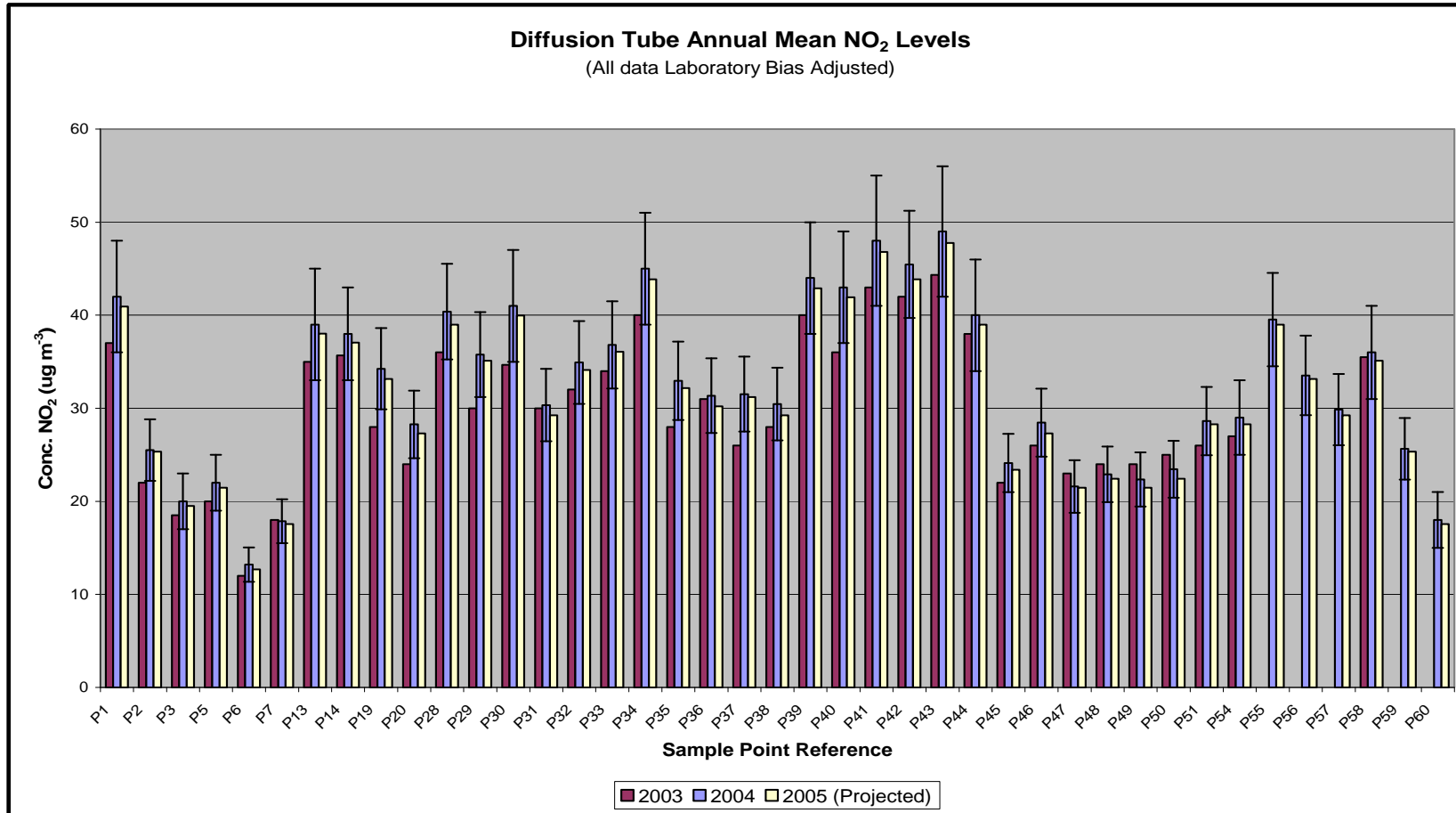


Figure A3.3 – Graphical comparison of change in annual mean NO₂ concentrations (adjusted) between 2003, 2004 and 2005 (projected). Results are presented by sampling location.



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Enquiries about information in this document and other aspects of air quality should be made to :

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