INTRODUCTION

This report is an updating and screening assessment (USA) of air quality in West Lothian as required to be undertaken by all local authorities. There are chapters on each of the 7 pollutants as identified in the Air Quality Strategy and a conclusion as to whether there is a need to proceed to a detailed assessment.
The objective of the USA is to identify those matters that have changed since the last review and assessment, which might lead to a risk of an air quality objective being exceeded.

The approach uses a checklist to identify significant changes that require further consideration. As was recommended at the first and second stage review and assessment the mobile air-quality monitoring unit (Groundhog) has been moved around West Lothian to determine the existing Nitrogen dioxide (NO_2), Particulate Matter (PM_{10}), Sulphur dioxide (SO_2) and Carbon Monoxide (CO) levels, in Whitburn and Bathgate as well as Linlithgow. At present the Groundhog is located at Manse Rd, Whitburn and results for all the pollutants analysed at the Groundhog in Whitburn can be viewed on the web-site at www.air-quality.net. The locations chosen for the Groundhog were done so following the first and second stage review and assessment. This identified that further monitoring of NO_2 & PM_{10} was necessary, particularly in busy town centres with some traffic congestion. The use of the real-time monitoring data is far more accurate to use for predicting future levels and exceedences than the use of background Internet maps and models based on these background levels.
Maps showing the exact groundhog locations in each of the town centres can be found at the end of the report.

AIR-QUALITY MONITORING UNIT - QA/QC SYSTEM

The Groundhog is a mobile air-quality monitoring unit, which has been with West Lothian Council, Environmental Health dept since September 1999. The Groundhog is used to house real-time analysers measuring carbon monoxide (CO), nitrogen dioxide (NO_2), oxides of nitrogen (NOX), nitric oxide (NO), sulphur dioxide (SO_2), and particulate matter (PM_{10}).
Data is downloaded to a computer through a modem link using Enview software every eight hours, so that levels can be checked daily and also to make sure that there have been no exceedences.
Regular checks are carried out on the analysers to ensure data validity and to ensure that they are working efficiently. A quality control/quality assurance procedure is in place for checking gas levels, which are checked once a week, a record of when new gas cylinders have been installed, filter changes and site visits.
The gases zero air, nitric oxide, carbon monoxide and sulphur dioxide are supplied by Messer and are used to calibrate the real-time analysers to ensure the data is valid.
EMC are an Environment Engineering company who supplied West Lothian Council with the Groundhog. West Lothian Council has a maintenance contract with EMC and they provide technical support 9am to 5pm, Monday to Friday for the Enview software and also maintain the equipment with a service carried out every six months. The contract also includes a 48-hour call-out for any equipment breakdown so that the fault can be quickly identified and reported to minimise data loss.

TEOM (tapered element oscillating microbalance) - PM_{10} Analyser
The filter in the TEOM is changed before the lifetime of the filter reaches 85%. Before the filter is changed, a pre-calibration checklist is filled in and once the filter has been changed, a post-calibration checklist is filled in one hour later. This ensures that there are not any faults with the TEOM. The TEOM Head is also cleaned after each time the filter is changed.

CALIBRATION
The Calibration report in Enview software is checked daily and a report is kept weekly for the gases CO, NO, NOX & SO_2 to identify if there is a drift between the span measured and span reference. The analysers carry out an automatic calibration each day. The calibration factor for each gas is calculated by dividing the “expected” cylinder concentration and dividing it by the actual “span” response minus the “zero” response concentration shown on the analyser. Ideally the calibration factor should be near to 1.000. If there is a sudden drift between the span measured and span reference then this can indicate that there may be a fault with the analyser. If the drift is +/- 30% then a manual calibration can be carried out before it becomes a problem and before the status changes to Invalid. If after a manual calibration has been carried out there is still a large drift then EMC are notified and investigate the fault within 48 hours. If there appears to be a fault with one of the analysers and EMC are notified then a diagnostics sheet is filled out at the Groundhog and is faxed through to EMC. This gives the engineer an idea of what the problem is before the visit.

DATA VALIDATION
A Periodic report in Enview software is carried out once a month for the pollutants NO_2, SO_2, CO& PM_{10}. This is so that the data can be screened and to ensure that any large peaks or high concentrations due to breakdowns of the analyser can be invalidated.
There are also strategies in place to minimise data loss. When a periodic report is carried out each month the data is transferred into Excel and saved onto CD-ROM so as to back up the data and the raw data is also saved onto CD-ROM.
The Groundhog has an air-conditioning unit so that a constant temperature can be kept in the Groundhog throughout the year and therefore the analysers are less likely to breakdown.
There are also alarm settings on each of the analysers, so that if there is a fault with one of the analysers it can be detected and resolved quickly.

CHAPTER 1

REVIEW AND ASSESSMENT FOR BENZENE

INTRODUCTION

In the U.K the main sources of Benzene emissions are petrol-engined vehicles, petrol refining and uncontrolled emissions from petrol stations without vapour recovery.
A number of policy measures already in place, or planned for future years, will continue to reduce emissions of benzene. Since January 2000, EU legislation has reduced the maximum benzene content of petrol to 1%, from a previous upper limit of 5%. The European Auto-Oil programme will further reduce emissions for cars and light-duty vehicles, and emissions of benzene from the storage and distribution of petrol are controlled by vapour recovery systems.

Standard and Objective for Benzene

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

All authorities:
Running annual mean of 16.25μg/m³ to be achieved by 31.12.2003

Authorities in Scotland and Northern Ireland only:
Running annual mean of 3.25μg/m³ to be achieved by 31.12.2010

MONITORING DATA RESULTS: 2000 TO 2002

In West Lothian there are 3 sites in busy town centre locations and benzene is measured using BTX tubes (Benzene, Toluene & Xylene Tubes) which are co-located with our Nitrogen dioxide (NO_2) diffusion tubes.
The 3 roadside sites are 212 High St, Linlithgow, 15 East Main St, Whitburn and 18-22 East Main St, Broxburn.
There are no local industrial sources of the BTX compounds.

The following graphs show the monthly benzene results for the three sites in West Lothian.

Figure 1.1 – Monthly Benzene results (μg/m³) – Year 2000

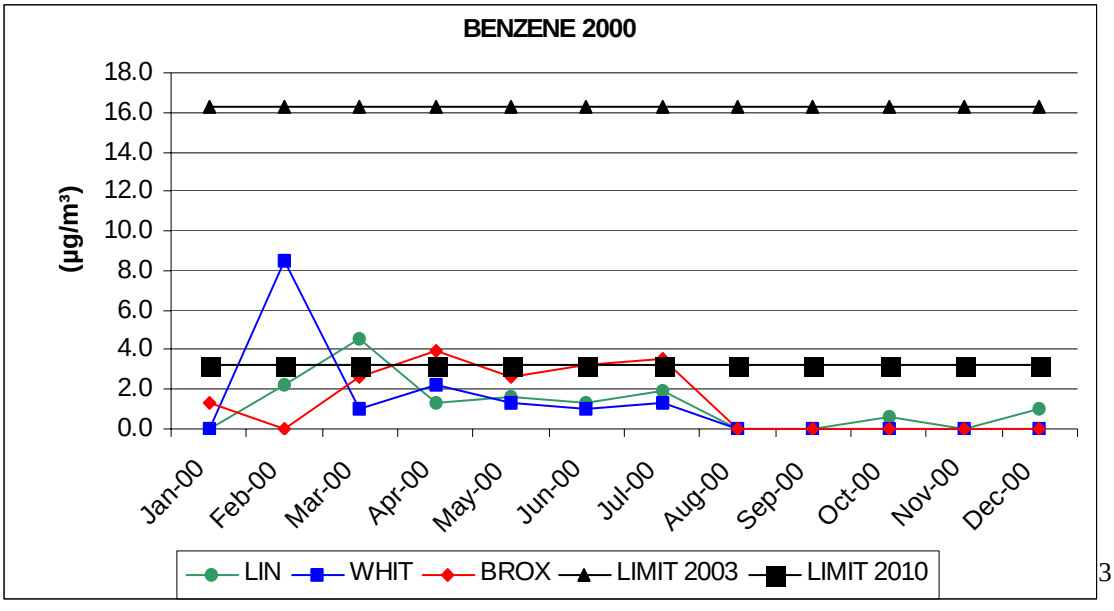


Figure 1.2– Monthly Benzene results (µg/m³) – Year 2001

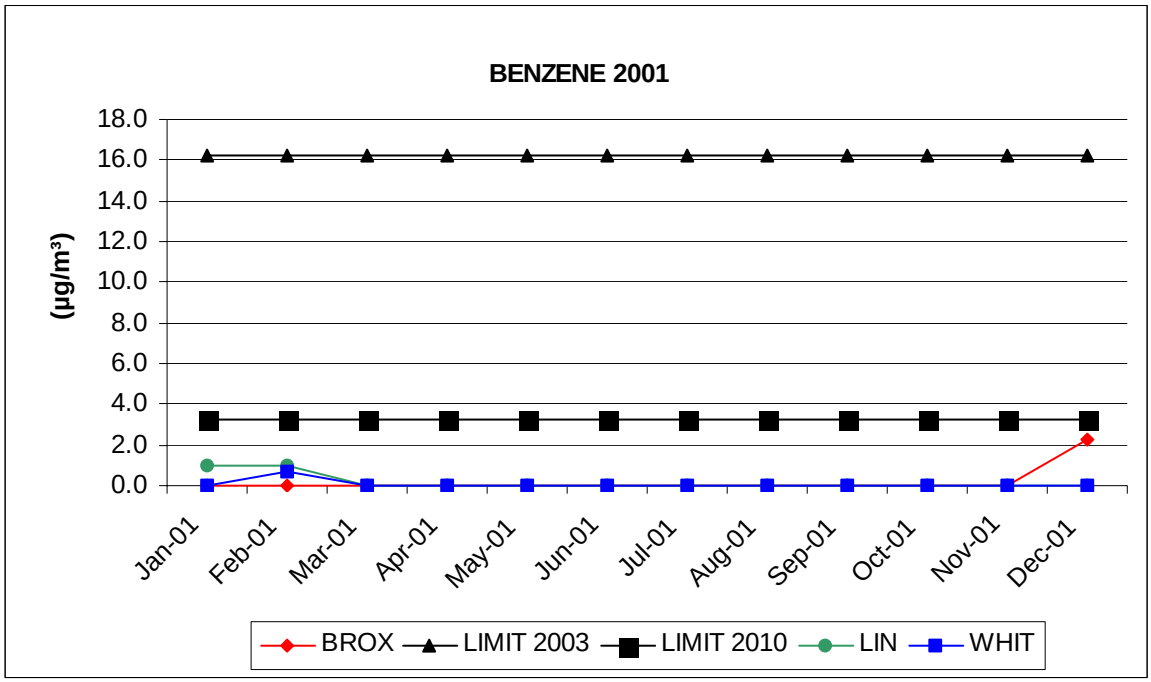


Figure 1.3– Monthly Benzene results (µg/m³) – Year 2002

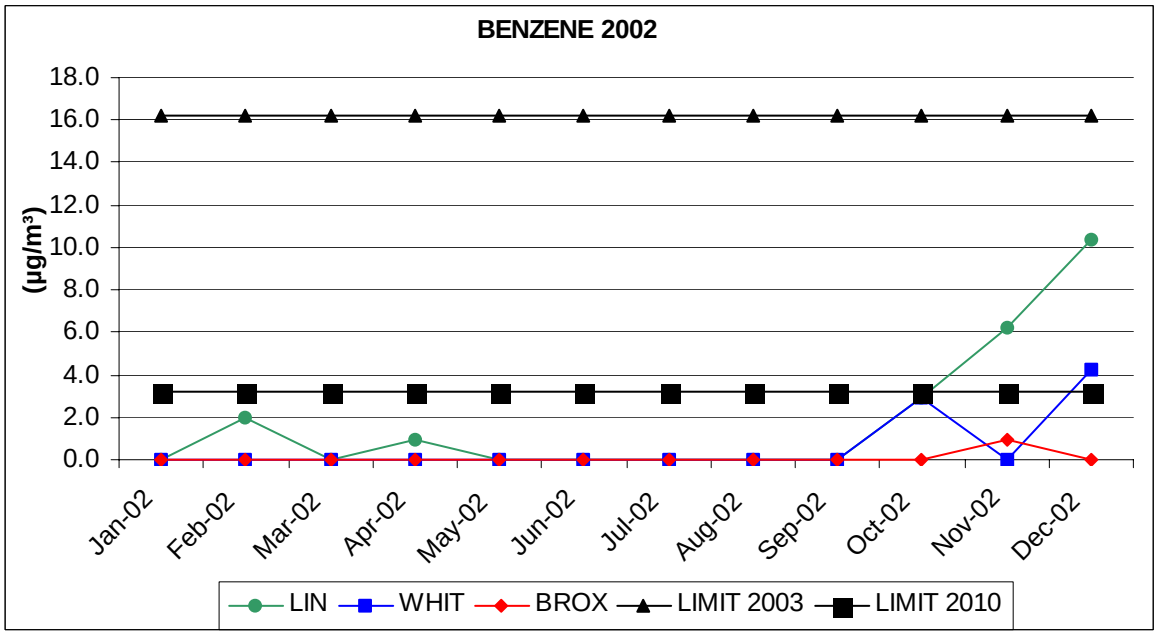


Table 1.1 - Annual Average Results – 2000 to 2002
(Results are in μg/m³)

YEAR	Linlithgow	Whitburn	Broxburn
2000	**1.95**	**2.6**	**2.6**
2001	**0.98**	**0.7**	**2.3**
2002	**1.95**	**0.7**	**0.7**

The annual average results show that in West Lothian concentrations of benzene are currently being achieved for the air quality objective for 2003 of a running annual mean of 16.25μg/m³. The 2010 air quality objective of 3.25μg/m³ has also been achieved. Predictions for benzene levels in 2003 and 2010 can be seen on pages 7& 8.

Table 1.2 - Results for Benzene, Toluene and Xylene – Year 2000
(Results are in ppb for Toluene and Xylene)

	Linlithgow			Whitburn			Broxburn		
	Benzene	Toluene	Xylene	Benzene	Toluene	Xylene	Benzene	Toluene	Xylene
Jan-00	<0.2	0.3	<0.2	<0.2	1.00	<0.2	0.40	1.80	0.60
Feb-00	0.7	5.0	1.3	2.60	0.30	<0.2	<0.2	0.50	<0.2
Mar-00	1.4	0.5	4.5	0.30	1.60	1.80	0.80	2.00	0.80
Apr-00	0.4	0.6	5.6	0.70	3.20	2.60	1.20	3.00	1.80
May-00	0.5	1.4	0.8	0.40	1.10	0.50	0.80	2.20	1.30
Jun-00	0.4	1	<0.2	0.30	1.20	<0.2	1.00	4.70	<0.2
Jul-00	0.6	1.5	1	0.40	1.10	0.50	1.10	5.40	5.80
Aug-00	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sep-00	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Oct-00	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nov-00	<0.2	0.6	0.3	<0.2	<0.2	<0.2	0.30	1.00	0.50
Dec-00	0.3	2.6	2.1	<0.2	<0.2	<0.2	<0.2	0.70	0.40
Average	**0.6**	**1.5**	**2.2**	**0.8**	**1.4**	**1.4**	**0.8**	**2.4**	**1.6**
Benzene (μg/m³)	**1.95**			**2.6**			**2.6**		

Table 1.3 - Results for Benzene, Toluene and Xylene – Year 2001
(Results are in ppb for Toluene and Xylene)

	Linlithgow			Whitburn			Broxburn		
	Benzene	Toluene	Xylene	Benzene	Toluene	Xylene	Benzene	Toluene	Xylene
Jan-01	0.3	2.6	2.1	<0.2	<0.2	<0.2	<0.2	0.7	0.4
Feb-01	0.3	1	0.8	0.2	0.9	0.3	<0.2	<0.2	<0.2
Mar-01	<0.2	0.8	0.4	<0.2	1.1	0.8	<0.2	0.4	0.2
Apr-01	<0.2	1.8	0.4	<0.2	1.7	0.7	<0.2	4.6	0.6
May-01	<0.2	1.1	0.7	<0.2	0.3	0.3	<0.2	0.2	<0.2
Jun-01	<0.2	0.6	0.8	<0.2	0.2	0.6	<0.2	<0.2	0.2
Jul-01	<0.2	4.6	2.1	<0.2	0.7	1.2	<0.2	<0.2	<0.2
Aug-01	<0.2	0.2	0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sep-01	<0.2	30.5	11.7	<0.2	8.7	6.3	<0.2	8.7	2.8
Oct-01	<0.2	0.4	0.2	<0.2	34	1.6	<0.2	8.7	0.6
Nov-01	<0.2	1.1	1.1	<0.2	1.2	0.9	<0.2	2.6	0.5
Dec-01	<0.2	0.5	<0.2	<0.2	1.8	0.2	0.7	7.8	2.8
Average	**0.3**	**3.8**	**1.9**	**0.2**	**5.1**	**1.3**	**0.7**	**4.2**	**1.0**
Benzene (μg/m³)	**0.98**			**0.7**			**2.3**		

Table 1.4 - Results for Benzene, Toluene and Xylene – Year 2002
(Results are in ppb for Toluene and Xylene)

	Linlithgow			Whitburn			Broxburn		
	Benzene	Toluene	Xylene	Benzene	Toluene	Xylene	Benzene	Toluene	Xylene
Jan-02	<0.2	1.1	0.4	<0.2	<0.2	<0.2	<0.2	40.1	3.6
Feb-02	0.6	8.8	5	<0.2	1.9	0.3	<0.2	<0.2	<0.2
Mar-02	<0.2	1.2	0.6	<0.2	0.7	<0.2	<0.2	0.2	0.3
Apr-02	0.3	2.3	0.8	<0.2	0.7	<0.2	<0.2	1	0.3
May-02	<0.2	0.8	0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Jun-02	<0.2	4.2	1.5	<0.2	1.1	0.2	<0.2	<0.2	<0.2
Jul-02	<0.2	5.5	5.2	<0.2	15	2.9	<0.2	0.9	<0.2
Aug-02	<0.2	2.4	0.8	<0.2	2.3	0.7	<0.2	0.3	<0.2
Sep-02	<0.2	1.9	<0.2	<0.2	1	0.2	<0.2	<0.2	<0.2
Oct-02	0.9	15.7	10.3	0.9	12.8	13.6	<0.2	12.9	9.1
Nov-02	1.9	5.6	3.2	<0.2	6.9	3.8	0.3	<0.2	0.5
Dec-02	3.2	9	7.7	1.3	11	7.2	<0.2	0.6	0.5
Average	**0.6**	**4.9**	**3.0**	**0.2**	**4.5**	**2.4**	**0.2**	**4.7**	**1.2**
Benzene ($\mu g/m^3$)	**1.95**			**0.7**			**0.7**		

DATA RATIFICATION

Using the guidance given in A1.82 that the ratio of BTEX compounds in ambient air is of the order :benzene:toluene:ethylbenzene:(m+p)-xylene:o-xylene is approximately 1:3.5:1:2:1 i.e if benzene is 1μg/m³ then the toluene will be 3.5μg/m³ etc.
As can be seen from the monitoring results in West Lothian for benzene, toluene and xylene there are some significant variations in the measured ratio 1:3.5:1:2:1 This indicates that perhaps some future monitoring should be carried out with some additional sites added to the existing sites.

Predictions for Benzene annual mean concentrations in 2003 & 2010

Prediction in 2003 for annual mean concentrations
(Calculation taken from Technical Guidance pg3-6, Box 3.4)

Table 1.5 – Prediction for 2003 using 2000 annual average (see table 1.1)

Calculation: 2000 Annual Average x 2003 Correction Factor ÷ 2000 Correction Factor

LOCATION	2000 Annual Average	2003 Correction Factor	2000 Correction Factor	2003 Prediction
LINLITHGOW	1.95	0.871	1.069	**1.59** μg/m³
WHITBURN	2.6	0.871	1.069	**2.1** μg/m³
BROXBURN	2.6	0.871	1.069	**2.1** μg/m³

Table 1.6 – Prediction for 2003 using 2001 annual average (see table 1.1)

Calculation: 2001 Annual Average x 2003 Correction Factor ÷ 2001 Correction Factor

LOCATION	2001 Annual Average	2003 Correction Factor	2001 Correction Factor	2003 Prediction
LINLITHGOW	0.98	0.871	1.000	**0.85**μg/m³
WHITBURN	0.7	0.871	1.000	**0.61**μg/m³
BROXBURN	2.3	0.871	1.000	**2.00**μg/m³

Table 1.7 – Prediction for 2003 using 2002 annual average (see table 1.1)

Calculation: 2002 Annual Average x 2003 Correction Factor ÷ 2002 Correction Factor

LOCATION	2002 Annual Average	2003 Correction Factor	2002 Correction Factor	2003 Prediction
LINLITHGOW	1.95	0.871	0.931	**1.82**μg/m³
WHITBURN	0.7	0.871	0.931	**0.65**μg/m³
BROXBURN	0.7	0.871	0.931	**0.65**μg/m³

These predictions for benzene for 2003 show that the air quality objective of 16.25μg/m³ should be achieved and it is not considered necessary to proceed to a detailed assessment.

Prediction in 2010 for annual mean concentrations
(Calculation taken from Technical Guidance pg3-6, Box 3.4)

Table 1.8 – Prediction for 2010 using 2000 annual average (see table 1.1)

Calculation: 2000 Annual Average x 2010 Correction Factor ÷ 2000 Correction Factor

LOCATION	2000 Annual Average	2010 Correction Factor	2000 Correction Factor	2010 Prediction
LINLITHGOW	1.95	0.647	1.069	**1.18** μg/m³
WHITBURN	2.6	0.647	1.069	**1.57** μg/m³
BROXBURN	2.6	0.647	1.069	**1.6** μg/m³

Table 1.9 – Prediction for 2010 using 2001 annual average (see table 1.1)

Calculation: 2001 Annual Average x 2010 Correction Factor ÷ 2001 Correction Factor

LOCATION	2001 Annual Average	2010 Correction Factor	2001 Correction Factor	2010 Prediction
LINLITHGOW	0.98	0.647	1.000	**0.65**μg/m³
WHITBURN	0.7	0.647	1.000	**0.45**μg/m³
BROXBURN	2.3	0.647	1.000	**1.49**μg/m³

Table 1.10 – Prediction for 2010 using 2002 annual average (see table 1.1)

Calculation: 2002 Annual Average x 2010 Correction Factor ÷ 2002 Correction Factor

LOCATION	2002 Annual Average	2010 Correction Factor	2002 Correction Factor	2010 Prediction
LINLITHGOW	1.95	0.647	0.931	**1.36**μg/m³
WHITBURN	0.7	0.647	0.931	**0.49**μg/m³
BROXBURN	0.7	0.647	0.931	**0.49**μg/m³

The predictions for benzene for 2010 show that the air quality objective of 3.25μg/m³ should be achieved in West Lothian and it is not considered necessary to proceed to a detailed assessment.

Questions from Technical Guidance
(pg3-12)

Are there any running annual means greater than 16.25μg/m³?
As can be seen from the results there are no annual means greater than 16.25μg/m³.

Are any running annual means greater than 3.25μg/m³?
There are currently no annual means greater than 3.25μg/m³.

Since the answer to both of these questions is no there is no need to proceed to a detailed assessment for benzene.

Very busy roads or junctions in built up areas

This does not apply to any busy roads or junctions that we have in West Lothian.

INDUSTRIAL SOURCES

Information from SEPA indicates that there are no new industrial sources of benzene since the First & Second Stage Review and Assessment.

PETROL STATIONS

From the list supplied by SEPA for Petrol Stations, there are two, which are near to busy roads, and these are the petrol stations at the Lizzie Bryce roundabout and at the Deer Park roundabout. Both of these are situated off the A899 in Livingston and this road has an annual average daily traffic flow of 40,000 vehicles.
However, neither of these petrol stations have relevant exposure of residential areas within 10 metres of the pumps.

MAJOR FUEL STORAGE DEPOTS (Petrol only)

As notified by SEPA there are not any major fuel storage depots in West Lothian.

CONCLUSION FOR BENZENE

Monitoring has indicated that the two air quality standards and objectives of 16.25μg/m³ for 2003 and 3.25μg/m³ for 2010 are currently being complied with in West Lothian.
There are no significant industrial sources of benzene located either within West Lothian or neighbouring areas which, are likely to adversely affect air quality within West Lothian.
There is therefore, no need requirement to proceed to a detailed assessment.

A recommendation that could be considered for benzene is to perhaps add some more monitoring sites throughout West Lothian and also specifically to carry out some monitoring close to the two petrol stations at Lizzie Bryce roundabout, Livingston and Deer Park, Livingston both off the busy A899.

CHAPTER 2

REVIEW AND ASSESSMENT OF 1,3-BUTADIENE

INTRODUCTION

In the U.K the main source of 1,3 Butadiene is car exhaust emissions.
1,3 Butadiene is also an important industrial chemical and is handled in bulk at a small number of industrial premises.
Concentrations of 1,3-butadiene are measured at a limited number of U.K national network sites. Maximum running annual mean concentrations of 1,3-butadiene measured at all urban background/centre and roadside locations are already well below the 2003 objective of 2.25μg/m³.
The increasing number of vehicles equipped with three way catalysts will significantly reduce emissions of 1,3 –butadiene in future years. Recently agreed further reductions in vehicle emissions and improvements to fuel quality, including those as part of the Auto-oil programme, are expected to further reduce emissions of 1,3-butadiene from vehicle exhausts. These measures are expected to deliver the air quality objective by the end of 2003, and no further measures are thought to be needed. Only those authorities with relevant locations in the vicinity of major industrial processes, which handle, store or emit 1,3-butadiene, are expected to proceed beyond the updating and screening assessment.

Standard and Objective for 1,3-Butadiene

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

Running annual mean of 2.25μg/m³ to be achieved by 31.12.2003

MONITORING DATA

In West Lothian there are no significant industrial sources of 1,3 Butadiene located either within West Lothian or in any neighbouring areas.

At present no monitoring is carried out in West Lothian for 1,3 Butadiene. In the first and second stage review and assessment of air quality some monitoring was carried out in 1998 for nine sites over eight months and all levels were less than 1.125μg/m³ (0.5ppb). These results were under the air quality objective of 2.25μg/m³ as a running annual mean.

Table 2.1 - The results for the study undertaken in 1998 can be seen below.
(Results are in ppb)

DATE	Armadale	Bathgate	Beecraigs	Broxburn	Kirknewton	Uphall Station	West Calder	Whitburn	Linlithgow
MAY 98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
JUN 98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
JUL 98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
AUG 98	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SEP 98	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
OCT 98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
NOV 98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3
DEC 98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Questions from Technical Guidance

Are any current running annual means greater than 2.25μg/m^3?
West Lothian have not carried out any further monitoring of 1,3-butadiene since the first and second stage review and assessment of air-quality because as can be seen from the above results this pollutant is not considered to be a problem in West Lothian.
Therefore, it is not considered necessary to proceed to a detailed assessment for 1,3-butadiene.

NEW INDUSTRIAL SOURCES

Information from SEPA indicates that there are no new sources of 1,3-butadiene in West Lothian.

INDUSTRIAL SOURCES WITH SUBSTANTIALLY INCREASED EMISSIONS

Information from SEPA indicates that there are no new industrial sources with substantially increased emissions of 1,3-butadiene.

CONCLUSION FOR 1,3-BUTADIENE

From the information available from SEPA, there are no new industrial sources of 1,3-butadiene in West Lothian since the first stage review and assessment of 1,3-butadiene. There is no requirement to proceed to a detailed assessment.

CHAPTER 3

REVIEW AND ASSESSMENT FOR CARBON MONOXIDE

INTRODUCTION

The main source of carbon monoxide in the U.K is road transport, which accounted for 67% of total releases in 2000 (the most recent year for which estimates are available). Annual emissions of carbon monoxide have been falling steadily since the 1970s, and are expected to continue to do so. Current projections indicate that road transport emissions will decline by a further 42% between 2000 and 2005. Higher levels of carbon monoxide are contained in exhaust gases when the engine is cold or badly tuned, or while the engine is idling or moving slowly. It is expected that levels of carbon monoxide will be highest close to busy roads in towns where traffic flow is reduced such as in rush hours, at junctions and where traffic calming measures exist.

Standard and Objective for Carbon Monoxide

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

Maximum daily 8-hr mean of 10.0mg/m³ to be achieved by 31.12.2003.

MONITORING DATA RESULTS: 2000 TO 2003

The objective for carbon monoxide is the maximum daily 8-hr mean of 10mg/m³ but only the 8-hr monthly maximum mean has been displayed on the graphs for all the three sites at which the real-time C0 analyser (mobile air quality monitoring unit) was located in West Lothian. The three sites are High St, Linlithgow, The Steelyard, Bathgate and the public car park at Manse Rd, Whitburn which are all busy town centres and should be considered worst case.

Figure 3.1 – LINLITHGOW 2000 – monthly maximum 8-hr mean

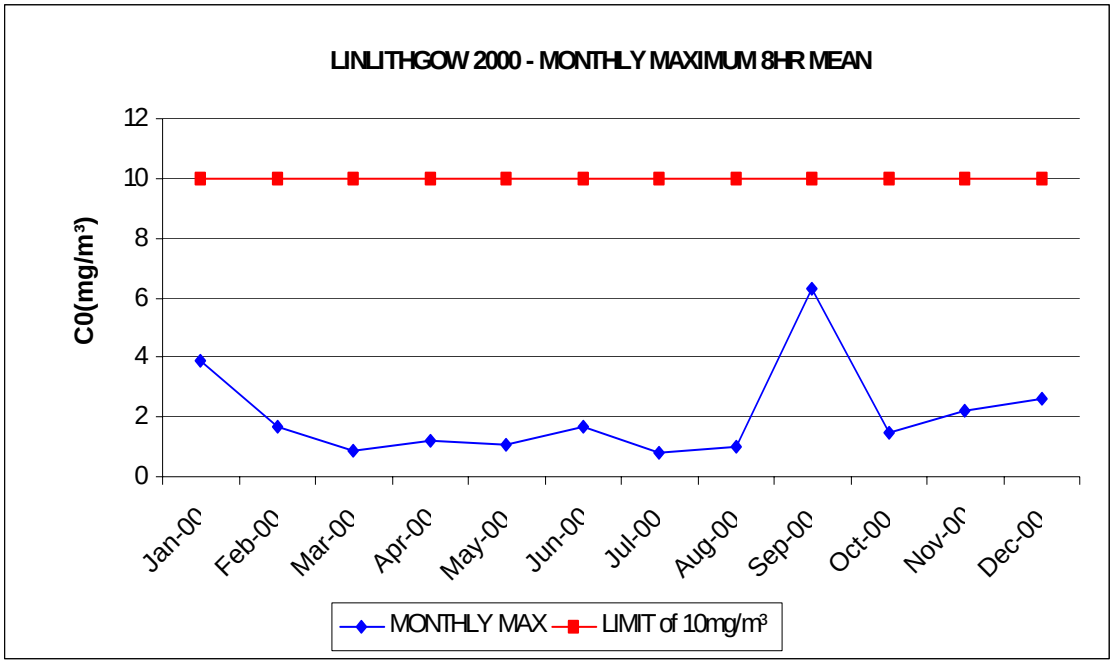


Figure 3.2 – LINLITHGOW – 01/01/01 to 11/05/01 – monthly maximum 8-hr mean

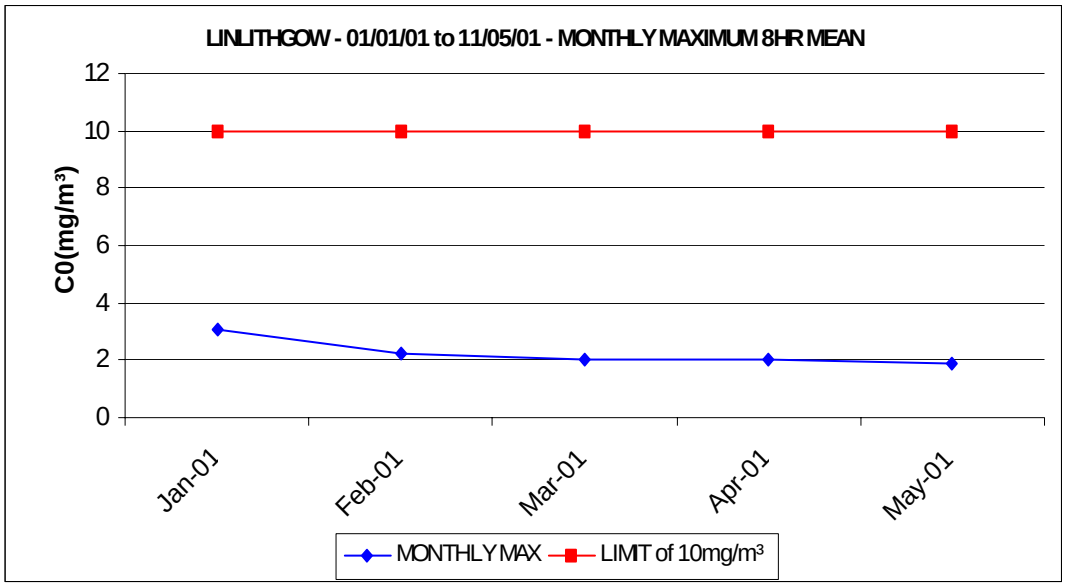


Figure 3.3 – BATHGATE – 18/05/01 to 30/11/01 – monthly maximum 8-hr mean

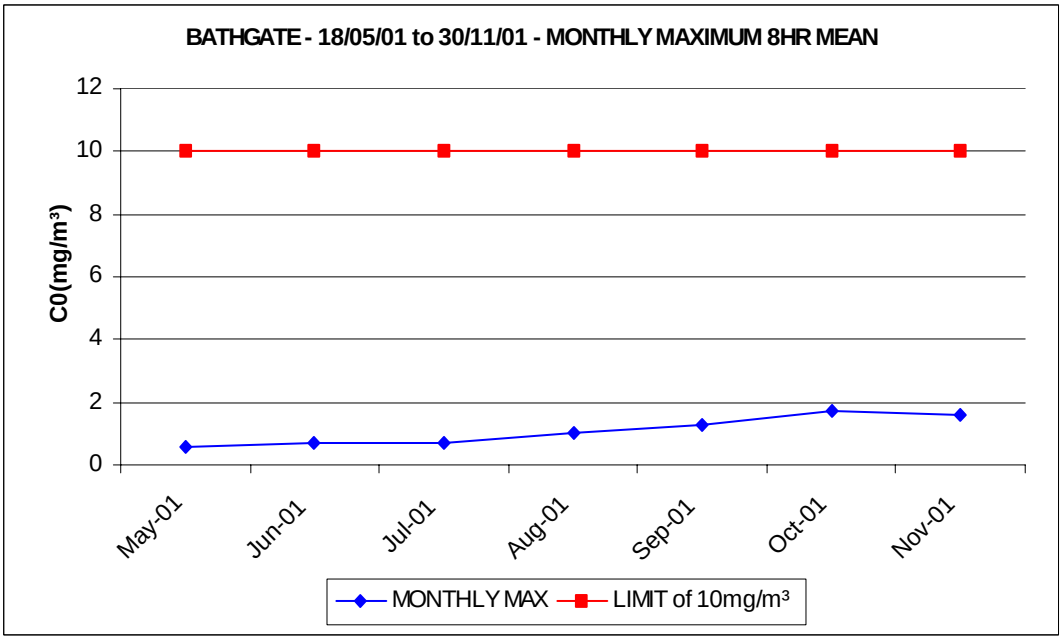


Figure 3.4 – LINLITHGOW – 05/12/01 to 07/06/02 – monthly maximum - 8hr mean

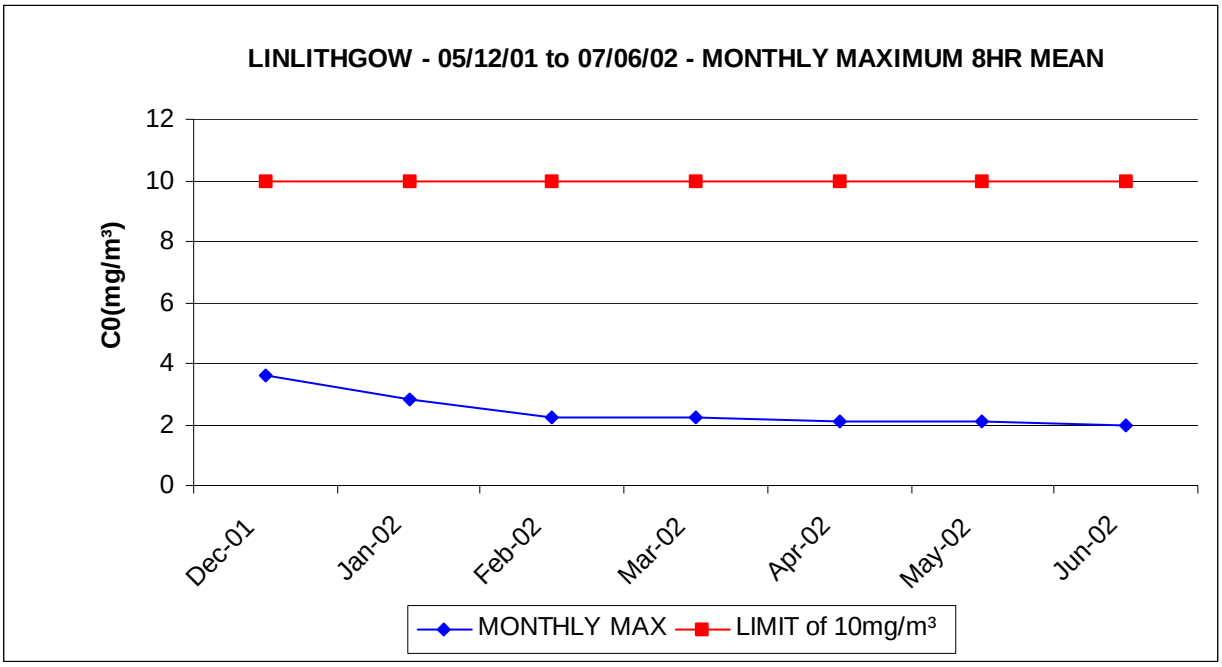
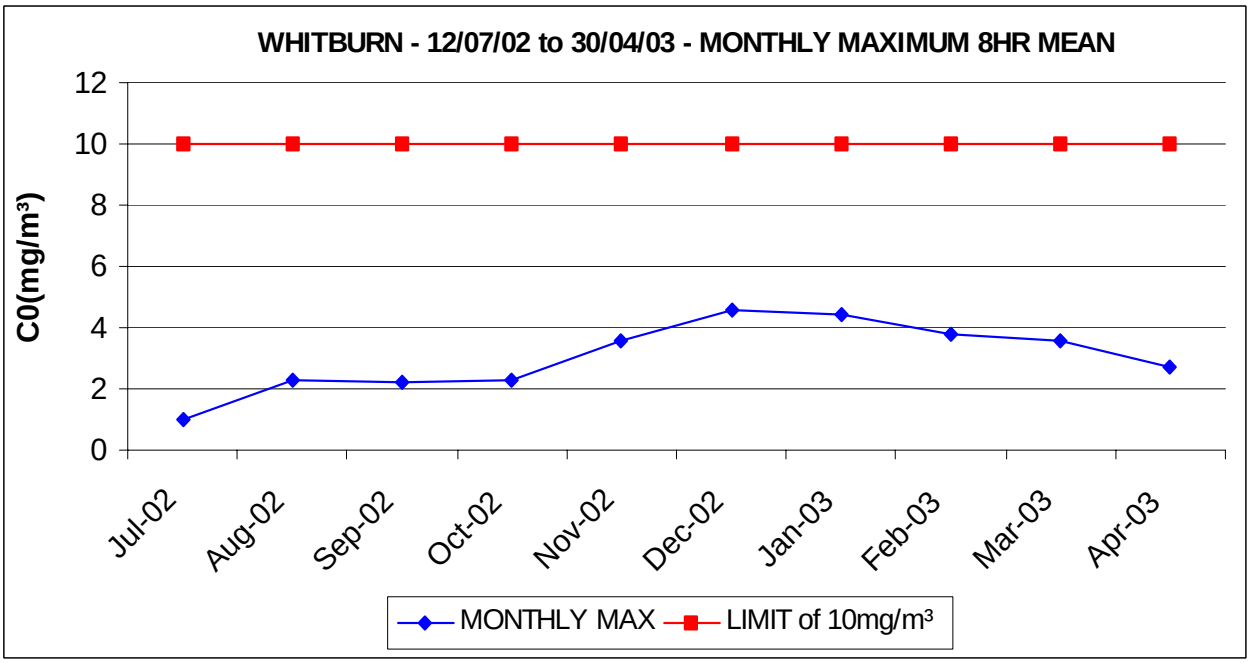


Figure 3.5 – WHITBURN– 12/07/02 to 30/04/03 – monthly maximum 8-hr mean



As can be seen from the graphs figs (3.1-3.5) there have been no exceedences of the maximum daily 8-hr mean of 10mg/m^3 at any of the three monitoring locations in West Lothian.

Question from Technical Guidance (LAQM. TG(03))

(page 2-5)

Are any current maximum daily running 8-hour concentrations greater than 10mg/m^3?
As can be seen from the results there have been no daily 8-hour concentrations greater than 10mg/m^3. Therefore, there is no requirement to proceed to a detailed assessment for carbon monoxide.

Very busy roads or junctions in built-up areas

There are no busy roads or junctions in West Lothian that fit the criteria definition of “very busy” as used in the guidance (page 2-6).

CONCLUSION FOR CARBON MONOXIDE

The results for carbon monoxide show that the air quality objective of 10mg/m^3 for 2003 is currently being achieved. Therefore, there is no requirement to proceed to a detailed assessment.

CHAPTER 4

REVIEW AND ASSESSMENT FOR LEAD

INTRODUCTION

Since 1st January 2000, there has been a ban on sales of leaded petrol in the United Kingdom. Emissions of lead are now restricted to some industrial activities such as battery manufacture, pigments in paints and glazes, alloys, radiation shielding, tank lining and piping. There are no significant industrial sources of lead either within West Lothian or in any neighbouring areas.

Standard and Objective for Lead

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

Annual mean of 0.5μg/m³ to be achieved by 31.12.2004

Annual mean of 0.25μg/m³ to be achieved by 31.12.2008

MONITORING DATA

At present no local monitoring is carried out for lead in West Lothian, as it is not considered to be a significant problem.

NEW INDUSTRIAL SOURCES

There are no new industrial sources of lead in West Lothian since the first stage review and assessment of lead.
However, as identified in the first stage review and assessment of lead, there are two Part A processes within West Lothian which have the potential to emit significant quantities of lead. These Part A processes are:

(1) Glacier Vander Vell, Whitehill Industrial Estate, Bathgate – Manufacturer of bearings and other products containing lead
(2) DKL Metals Ltd, Avontoun Works, Linlithgow – Foundry/Diecasting

However, it is highly unlikely that emissions from these two processes would result in exceedences of the air quality standards as SEPA have notified us that they are operating satisfactorily and complying with emissions standards.

There are no Part B processes within West Lothian which have the potential to emit significant quantities of lead.

INDUSTRIAL SOURCES WITH SUBSTANTIALLY INCREASED EMISSIONS

There are no industrial sources with substantially increased emissions of lead in West Lothian.

CONCLUSIONS FOR LEAD

There are no significant industrial sources of lead within West Lothian or within neighbouring areas. Therefore, lead is not considered to be a problem in West Lothian and no further monitoring will be required. There is no requirement to proceed to a detailed assessment.

CHAPTER 5

REVIEW & ASSESSMENT FOR NITROGEN DIOXIDE

INTRODUCTION

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen, and are collectively known as nitrogen oxides (NOX). All combustion processes produce NOX emissions, mostly in the form of nitric oxide, and are then converted to nitrogen dioxide as a result of reaction with ozone in the atmosphere. It is nitrogen dioxide that is known to adversely affect human health.

The main source of nitrogen oxides emissions are from road transport and accounts for about 49% of total emissions in the U.K. Motorways and other primary routes are a major source as well as conurbations and city centres with congested traffic. However, the contribution of road transport to nitrogen oxides emissions has reduced significantly in the past years.
Other significant sources of nitrogen oxides emissions include the electricity supply industry and other industrial and commercial sectors.

Standard and Objective for Nitrogen Dioxide

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

1-hour mean of 200μg/m³ not to be exceeded more than 18 times a year and to be achieved by 31.12.2005.

Annual mean of 40μg/m³ to be achieved by 31.12.2005.

MONITORING DATA RESULTS: 2000 TO 2003

In West Lothian, nitrogen dioxide is monitored using passive diffusion tubes and is also monitored using a real-time NOX analyser in the groundhog. There are six sites in total for the diffusion tubes and two tubes are co-located at five of the sites and three tubes are located directly on top of the groundhog for comparison with the real-time analyser. The diffusion tubes have been co-located at each site since July 2001.
Four of these diffusion tube sites are part of the National Nitrogen Dioxide Diffusion Tube Network in the U.K and these sites are East Main St, Whitburn, High St, Linlithgow, Cedric Rise, Livingston and High St, Bathgate. The first two are roadside sites and the other are background sites. East Main St, Broxburn is also another roadside diffusion tube site in West Lothian but is not part of the national network. The Broxburn site was chosen due to historical data indicating that some of the highest NO_2 levels were in Broxburn and it is also a busy town centre location.

The real-time analyser has been located at three sites in West Lothian and these sites are High St, Linlithgow, The Steelyard, Bathgate and at present is located in a public car park at Manse Rd, Whitburn. These sites were chosen as representing the worst case busy town centres in West Lothian.

One of the recommendations made by the Scottish Executive on the completion of the First and Second stage Review and Assessment was to co-locate the diffusion tubes with the real-time analyser to determine a bias factor for the diffusion tube survey. The diffusion tube results for the period January 2000 to June 2001 are uncorrected, as the tubes were not co-located with the Groundhog until July 2001.

Table 5.1 - Diffusion Tube Results – Year 2000- Results in μg/m³

Tables 5.1 & 5.2 show the NO_2 diffusion tube results before the tubes were co-located at each site and before any tubes were co-located at the Groundhog.

DATE	WL 1	WL2	WL3	WL4	WL5	WL6
JAN 2000	42	42	29	23	40	42
FEB 2000	22	23	13	17	21	27
MAR 2000	32	21	18	20	28	28
APR 2000	18	12	16	17	48	29
MAY 2000	29	22	19	8	39	32
JUN 2000	12	20	1	11	10	31
JUL 2000	29	25	55	15	29	35
AUG 2000	24	27	18	15	38	35
SEP 2000	21	23	12	15	32	37
OCT 2000	21	19	24	16	41	27
NOV 2000	29	31	19	22	35	40
DEC 2000	14	16	13	10	19	20
AVERAGE	**24**	**23**	**20**	**16**	**32**	**32**

Table 5.2 - Diffusion Tube Results – Jan 2001 to June 2001- Results in μg/m³

DATE	WL1	WL2	WL3	WL4	WL5	WL6
JAN 2001	14	16	13	10	19	20
FEB 2001	33	23	27	21	43	39
MAR 2001	21	22	14	17	40	0
APR 2001	33	25	0	14	38	45
MAY 2001	26	19	18	10	38	32
JUN 2001	19	20	11	11	28	29
AVERAGE	**24**	**21**	**14**	**14**	**34**	**28**

WL1 = East Main St, Whitburn
WL2 = George St, Bathgate
WL3 = Cedric Rise, Livingston
WL4 = High St, Bathgate
WL5 = East Main St, Broxburn
WL6 = High St, Linlithgow

Groundhog and Diffusion Tube comparison

Three diffusion tubes have been co-located with the Groundhog since July 2001. The following shows a comparison of the diffusion tubes with the real-time analyser and also how the bias factors have been calculated so they can be applied to the diffusion tube results from other sites in West Lothian.

The bias correction factors for the diffusion tubes were taken from Box 6.4, page 6-7 of the technical guidance.

Bias factor Method A:

A = Cm/Dm (Cm = annual mean real-time analyser result)
(Dm = annual mean diffusion tube result)

Bias factor Method B:

B = (Dm – Cm) / Cm

Bathgate – July 2001 to November 2001- Table 5.3

The real-time analyser was located at The Steelyard, Bathgate for 5 months from July 2001 to November 2001. Three diffusion tubes were co-located at this site during this time.

Table 5.3

Bathgate	Groundhog (Real-Time)	Co-located Diffusion Tubes (Average)
Jul-01	18.3	23
Aug-01	20	27
Sep-01	15.6	23
Oct-01	15.5	27
Nov-01	25.5	36
Average	**19.0**	**27.2**

Bias factor method A: 19.0 / 27.2 = **0.698**

Diffusion tube correction = 0.698 x 27.2 = **18.98μg/m³**

Bias factor method B: 27.2 – 19.0 / 19.0 = **0.431** (**43%** OVER READ)

During this five-month period the diffusion tubes were over reading by 43%.

Linlithgow – December 2001 to June 2002 – Table 5.4

The real-time analyser was located at Linlithgow High St for seven months from December 2001 to June 2002. Three diffusion tubes were again co-located at this site during this time.

Table 5.4

Linlithgow	Groundhog (Real-Time)	Co-located Diffusion Tube (Average)
Dec-01	22	30
Jan-02	20	23
Feb-02	17.5	29
Mar-02	22.4	33
Apr-02	23.7	28
May-02	14.8	23
Jun-02	16.6	16
Average	**19.6**	**26**

Bias factor method A: 19.6 / 26 = **0.753**

Diffusion Tube correction = 0.753 x 26 = **19.6μg/m³**

Bias factor method B: 26 – 19.6 / 19.6 = **0.327** (**33%** OVER READ)

During this five-month period the diffusion tubes were over reading by 33%.

Whitburn – July 2002 to March 2003 – Table 5.5

The real-time analyser has been located at Manse Rd, Whitburn since July 2002 and is at present still located at this site. There are 10 months of data available for both the diffusion tubes and real-time analyser at present.

Table 5.5

Whitburn	Groundhog (Real-Time)	Diffusion Tube
Jul-02	10.6	17
Aug-02	16.4	16
Sep-02	14.8	23
Oct-02	10.7	25
Nov-02	26.9	18
Dec-02	32.9	15
Jan-02	28.1	24
Feb-02	34.8	13
Mar-02	32.2	18
Apr-02	29.2	20
Average	**23.6**	**18.9**

Bias factor method A: 23.6/ 18.9 = **1.248**

Diffusion tube correction = 1.248 x 18.9 = **23.6μg/m³**

Bias factor method B: 18.9 – 23.6 / 23.6 = - 0.199 (**20%** UNDER READ)

During this ten-month period the diffusion tubes were under reading by 20%

As can be witnessed the bias factors are site specific and there is an significant variance between the sites. When bias factor method B was used there was an over read of 43% and 33% at Bathgate and Linlithgow and an under read of 20% at Whitburn.

This confirms that the use of diffusion tubes is a good screening method and was very helpful in the first & second stage review and assessment to identify “hot spots” in town centre locations as requiring further real-time monitoring.

DIFFUSION TUBE RESULTS

In this section a bias factor based on the co-located diffusion tubes with the Groundhog in each of its locations has been used against each diffusion tube site over the same time period.

Groundhog located at Bathgate – July 2001 to November 2001 – Results in µg/m³

The bias correction factor used is method A (0.698, see table 5.6) and has been applied to all of the diffusion tube mean results below using the bias factor calculated when the Groundhog was located in Bathgate. Two diffusion tubes are co-located at each site with three diffusion tubes located with the Groundhog.

Table 5.6

DATE	WL1	WL7	WL3	WL8	WL4	WL9	WL5	WL10	WL6	WL11	WL 12	WL 13	WL 14
JUL 01	21	25	9	11	11	10	30	30	31	23	24	23	21
AUG 01	14	21	~	~	14	11	35	10	6	28	27	27	28
SEP 01	24	14	20	17	15	16	35	36	29	36	31	18	19
OCT 01	27	24	18	17	17	13	31	23	34	31	21	32	29
NOV 01	29	25	24	12	9	8	38	48	35	35	42	43	22
Average	**25**	**24**	**18**	**14**	**15**	**13**	**33**	**31**	**26**	**31**	**30**	**29**	**24**
Bias Correction(0.698)	**18**	**17**	**12**	**10**	**11**	**9**	**23**	**22**	**18**	**22**	**21**	**20**	**17**

WL 1& 7 = WHITBURN

WL 3 & 8 = DEDRIDGE, LIVINGSTON

WL 4 & 9 = HIGH ST, BATHGATE

WL 5 & 10 = EAST MAIN ST, BROXBURN

WL 6 & 11 = HIGH ST, LINLITHGOW

WL 12, 13 & 14 = GROUNDHOG, BATHGATE (JULY 2001 to NOV 2001)

Groundhog located in Linlithgow – December 2001 to June 2002 – Results in µg/m³

The bias correction factor used is method A (0.753, see table 5.7) and has been applied to all of the diffusion tube average results below using the bias factor calculated when the Groundhog was located in Linlithgow.

Table 5.7

DATE	WL1	WL7	WL3	WL8	WL4	WL9	WL5	WL10	WL6	WL11	WL12	WL13	WL14
DEC 01	32	36	22	23	22	22	35	36	23	35	32	31	27
FEB 02	19	17	11	15	11	13	37	33	4	24	27	35	26
MAR 02	21	20	13	19	17	14	36	30	40	31	36	35	28
APR 02	25	23	16	20	13	14	37	30	30	33	32	24	27
MAY 02	18	22	16	14	11	4	27	35	21	29	26	19	24
JUN 02	20	21	13	10	8	11	27	22	26	29	18	18	12
Average	**23**	**23**	**15**	**17**	**14**	**13**	**33**	**31**	**24**	**30**	**29**	**27**	**24**
Bias Correction (0.753)	**17**	**17**	**11**	**13**	**11**	**10**	**25**	**23**	**18**	**23**	**22**	**20**	**18**

WL 1& 7 = WHITBURN

WL 3 & 8 = DEDRIDGE, LIVINGSTON

WL 4 & 9 = HIGH ST, BATHGATE

WL 5 & 10 = EAST MAIN ST, BROXBURN

WL 6 & 11 = HIGH ST, LINLITHGOW

WL 12, 13 & 14 = GROUNDHOG, LINLITHGOW (DEC 2001 TO JUNE 2002)

Groundhog located in Whitburn – July 2002 to April 2003 – Results in µg/m³

The bias correction factor used is method A (1.248, see table 5.7) and has been applied to all of the diffusion tube mean results below using the bias factor calculated when the Groundhog was located in Whitburn.

Table 5.8

DATE	WL1	WL7	WL3	WL8	WL4	WL9	WL5	WL10	WL6	WL11	WL12	WL13	WL14
JULY 02	25	24	15	14	13	~	24	30	26	32	12	18	21
AUG 02	14	16	11	22	13	14	27	25	28	31	15	14	18
SEPT 02	22	26	22	12	12	10	7	23	30	21	21	20	27
OCT 02	26	36	23	26	24	20	51	47	40	38	28	18	28
NOV 02	31	33	29	29	31	29	36	49	46	44	26	2	26
DEC 02	29	21	15	~	18	8	27	30	33	11	15	~	~
JAN 03	18	17	21	10	18	19	30	30	33	33	27	20	26
FEB 03	10	16	8	9	18	12	19	13	14	20	11	14	15
MAR 03	19	19	~	10	12	8	43	28	~	15	18	22	14
APR 03	32	32	19	23	17	15	40	40	40	30	26	15	18
AVERAGE	**23**	**24**	**18**	**17**	**18**	**15**	**30**	**32**	**29**	**28**	**20**	**16**	**19**
Bias Correction (1.248)	**29**	**30**	**23**	**22**	**23**	**19**	**37**	**40**	**36**	**35**	**25**	**20**	**21**

WL 1& 7 = WHITBURN

WL 3 & 8 = DEDRIDGE, LIVINGSTON

WL 4 & 9 = HIGH ST, BATHGATE

WL 5 & 10 = EAST MAIN ST, BROXBURN

WL 6 & 11 = HIGH ST, LINLITHGOW

WL 12, 13 & 14 = GROUNDHOG, WHITBURN (JULY 2002 TO PRESENT)

ANNUAL AVERAGE DIFFUSION TUBE RESULTS – July 2001 to June 2002

The following table shows the annual average NO_2 diffusion tube results with the bias factor correction applied to the results for when the Groundhog was based at Bathgate from July 2001 to November 2001 and when the Groundhog was located at Linlithgow from December 2001 to June 2002. This bias factor has been applied to each diffusion tube site in West Lothian.

Results are in $\mu g/m^3$

Table 5.9

DATE	**WL1**	**WL7**	**WL3**	**WL8**	**WL4**	**WL9**	**WL5**	**WL10**	**WL6**	**WL11**	**WL12**	**WL 13**	**WL 14**
July 01 to Nov 01	18	17	12	10	11	9	23	22	18	22	21	20	17
Dec 01 to Jun 02	17	17	11	13	11	10	25	23	18	23	22	20	18
Average of both sites	17.5	17	12	12	11	9.5	24	22.5	18	22.5	21.5	20	17.5
Annual Average	**17.25**		**12**		**10.25**		**23.25**		**20.3**		**19.7**		

WL 1& 7 = WHITBURN

WL 3 & 8 = DEDRIDGE, LIVINGSTON

WL 4 & 9 = HIGH ST, BATHGATE

WL 5 & 10 = EAST MAIN ST, BROXBURN

WL 6 & 11 = HIGH ST, LINLITHGOW

WL 12, 13 & 14 = GROUNDHOG

ANNUAL AVERAGE DIFFUSION TUBE RESULTS – Whitburn July 2002 to April 2003

The following table shows the annual average NO_2 diffusion tube results with the bias factor correction applied to the results for when the Groundhog was located at Whitburn from July 2002 to present. The bias factor was applied to each diffusion tube site.

Results are in μg/m³

Table 5.10

DATE	WL1	**WL7**	**WL3**	**WL8**	**WL4**	**WL9**	**WL5**	**WL10**	**WL6**	**WL11**	**WL 12**	**WL 13**	**WL 14**
July 02 to April 03	29	30	23	22	23	19	37	40	36	35	25	20	21
Annual Average	**29.5**		**23**		**21**		**38.5**		**35.5**		**22**		

WL 1& 7 = WHITBURN

WL 3 & 8 = DEDRIDGE, LIVINGSTON

WL 4 & 9 = HIGH ST, BATHGATE

WL 5 & 10 = EAST MAIN ST, BROXBURN

WL 6 & 11 = HIGH ST, LINLITHGOW

WL 12, 13 & 14 = GROUNDHOG

The diffusion tube data and the use of the bias factors show a huge variance depending on the siting of the co-located tubes with the analyser. West Lothian have long held the opinion that the use of diffusion tubes as a screening tool along with local knowledge were extremely useful in pinpointing hot spot areas that required further monitoring. It is obvious from the results that the decision some time ago to invest in a real-time NOX analyser has proved correct.

REAL-TIME MONITORING RESULTS: 2000 to 2003

The following graphs show the 1hr average for each site the Groundhog was located at in West Lothian. But only the maximum 1hr average for each month at each site has been displayed on the graphs, to show if there have been any exceedences of the 1-hour mean objective.

Figure 5.1 – Linlithgow High St - Year 2000

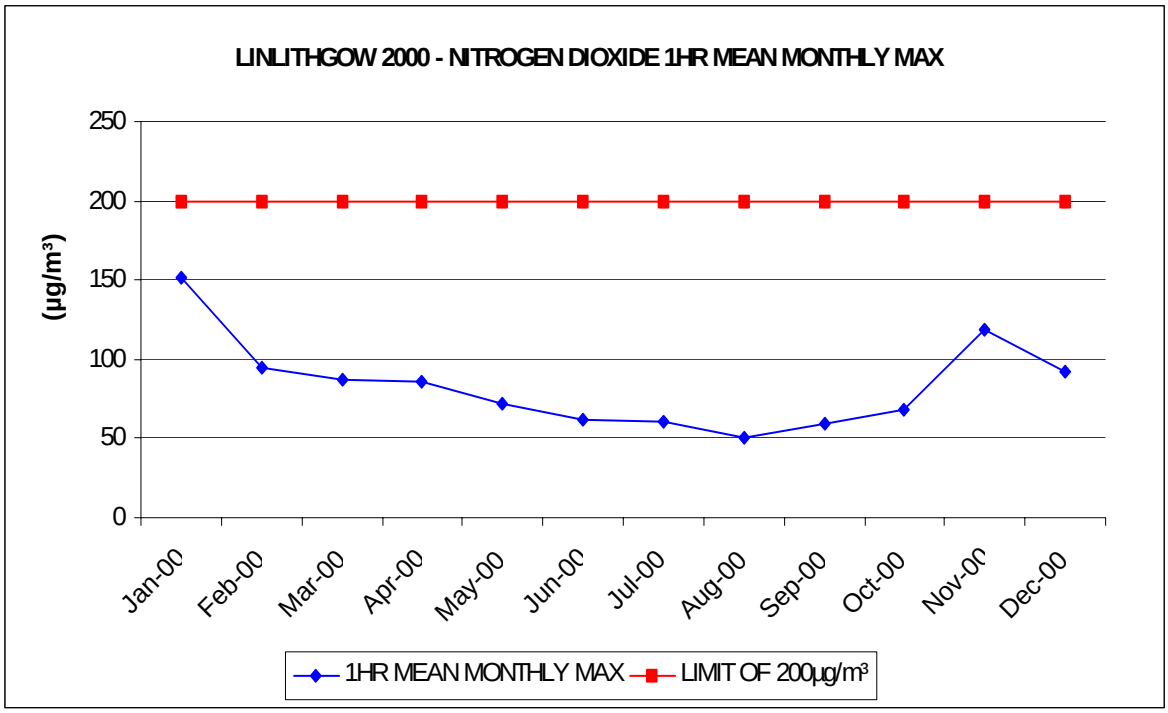


Table 5.11

MONTHLY AVERAGE	NO_2 (µg/m³)
Jan-00	32
Feb-00	27.6
Mar-00	31.5
Apr-00	30.5
May-00	27.4
Jun-00	14.3
Jul-00	23.5
Aug-00	12
Sep-00	22.9
Oct-00	20.9
Nov-00	39
Dec-00	28.6
ANNUAL AVERAGE (12 MONTHS)	**25.9**

From the graph above (figure 5.1) it can be seen that the highest reading for the 1hr mean for nitrogen dioxide in 2000 was 151.8 µg/m³ in January 2000 which meets the 1hr standard of 200µg/m³ for 31.12.2005. Table 5.10 above shows that there was an annual average of 25.9µg/m³ for nitrogen dioxide when the Groundhog was located at Linlithgow which, again meets the standard of 40µg/m³ for 31.12.2005.

(See predictions for 2005 on page 31 – calculation no.1)

Figure 5.2 – Linlithgow High St – 01/01/01 to 11/05/01

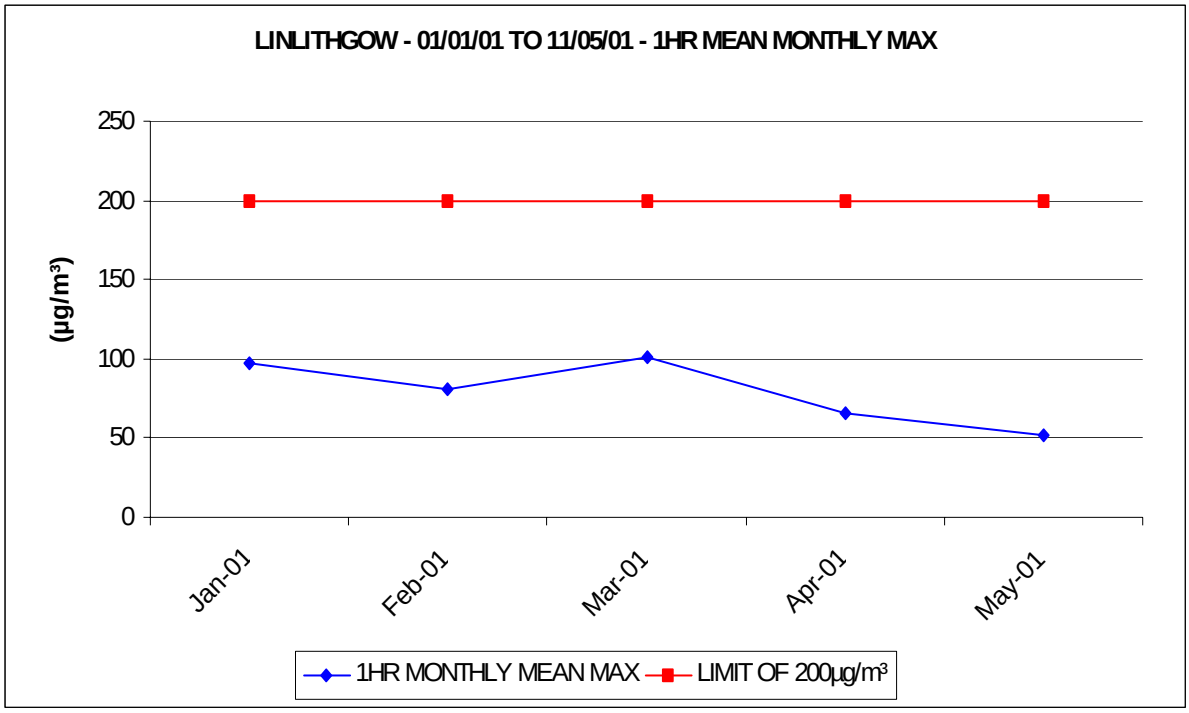


Table 5.12

MONTHLY AVERAGE	NO_2 (µg/m³)
Jan-01	36.4
Feb-01	33.4
Mar-01	32.2
Apr-01	20.7
May-01	24.1
ANNUAL AVERAGE (5 MONTHS)	29.4

From the graph above (figure 5.2) it can be seen that the highest reading for the 1hr mean for nitrogen dioxide from January 2001 to May 2001 was 101 µg/m³ which meets the 1hr standard of 200µg/m³ for 31.12.2005. Table 5.11 above shows that there was a five month average of 29.4µg/m³ for nitrogen dioxide when the Groundhog was located at Linlithgow even allowing for seasonal variations. This meets the standard of 40µg/m³ for 31.12.2005. (See predictions for predictions for 2005 on page 31 – calculation no.2)

Figure 5.3 – The Steelyard, Bathgate – 18/05/01 to 30/05/01

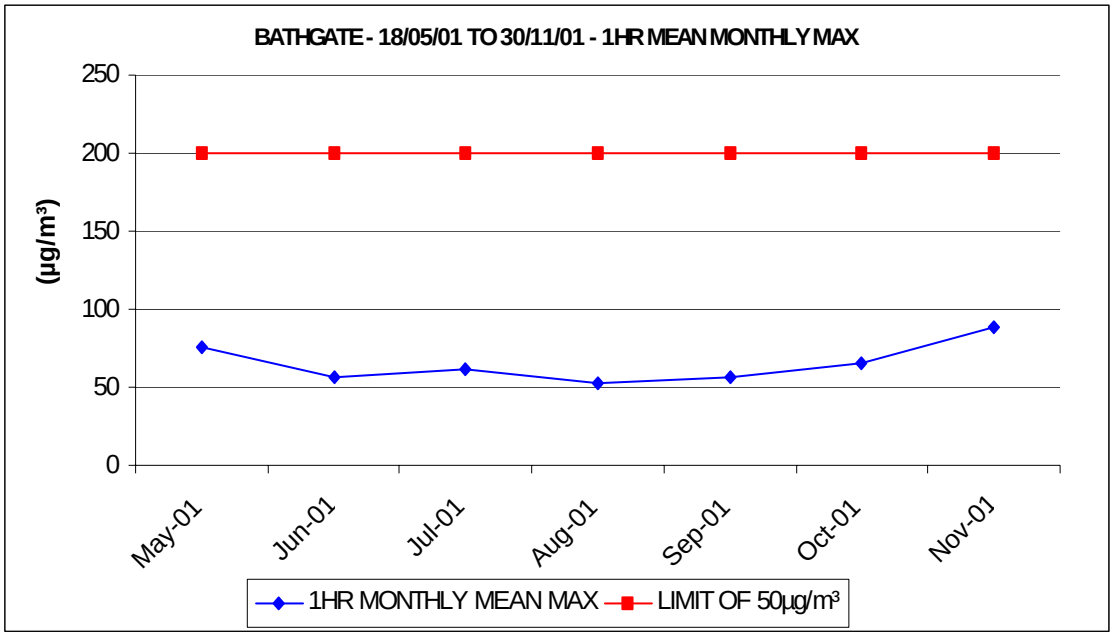


Table 5.13

MONTHLY AVERAGE	NO_2 (ug/m3)
May-01	15.3
Jun-01	18.6
Jul-01	18.3
Aug-01	20
Sep-01	15.6
Oct-01	15.5
Nov-01	25.5
ANNUAL AVERAGE (7 MONTHS)	18.4

From the graph above (figure 5.3) it can be seen that the highest reading for the 1hr mean for nitrogen dioxide from 18th May 2001 to 30th November 2001 was 87.9 µg/m³ in November 2001 which meets the 1hr standard of 200µg/m³ for 31.12.2005. Table 5.13 above shows that there was a seven month average of 18.4 µg/m³ for nitrogen dioxide when the Groundhog was located at Bathgate. This meets the objective of 40µg/m³ for 31.12.2005.
(See predictions for 2005 on page 31 – calculation no.3)

Figure 5.4 – Linlithgow High St – 05/12/01 to 07/06/02

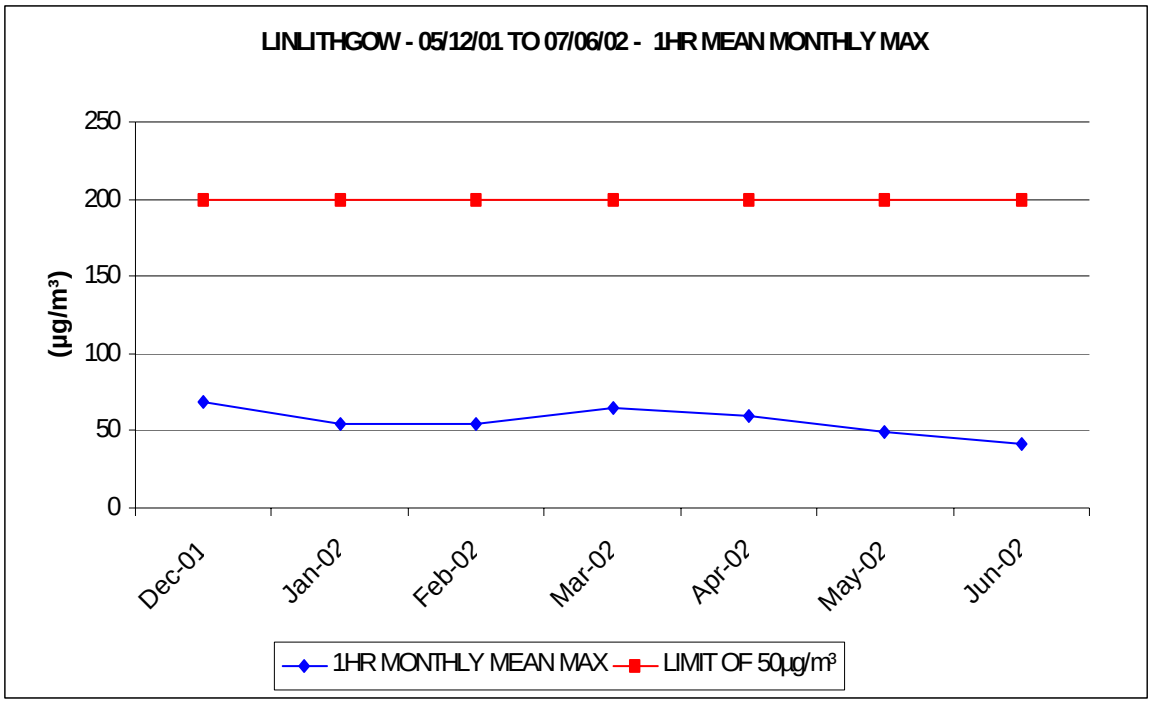


Table 5.14

MONTHLY AVERAGE	NO_2 (µg/m³)
Dec-01	22
Jan-02	20
Feb-02	17.5
Mar-02	22.4
Apr-02	23.7
May-02	14.8
Jun-02	16.6
ANNUAL AVERAGE (7 MONTHS)	19.6

From the graph above (figure 5.4) it can be seen that the highest reading for the 1hr mean for nitrogen dioxide from December 2001 to June 2002 was 68.8 µg/m³ in December 2001 which meets the 1hr standard of 200µg/m³ for 31.12.2005. Table 5.14 above shows that there was a seven month average of 19.6 µg/m³ for nitrogen dioxide when the Groundhog was located at Linlithgow High St, even allowing for seasonal variations. This meets the standard of 40µg/m³ for 31.12.2005.
(See predictions for 2005 on page 32 – calculation no.4)

Figure 5.5 – Manse Rd, Whitburn – July 2002 to April 2003

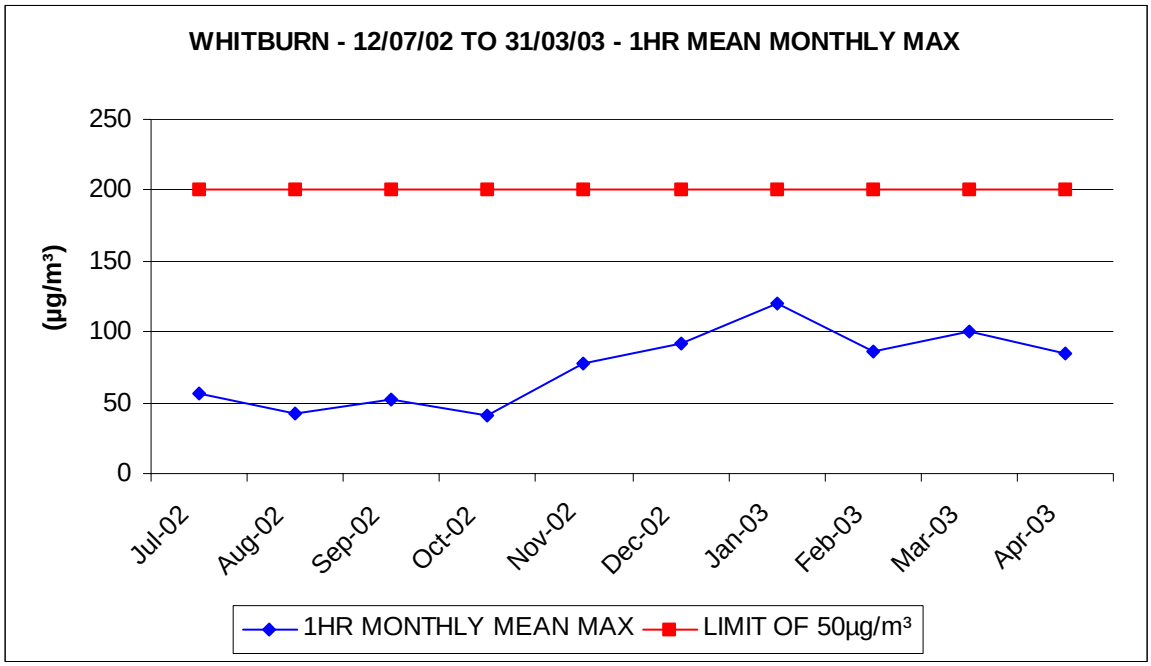


Table 5.15

MONTHLY AVERAGE	NO_2 (ug/m3)
Jul-02	10.6
Aug-02	16.4
Sep-02	14.8
Oct-02	10.7
Nov-02	26.9
Dec-02	32.9
Jan-03	28.1
Feb-03	34.8
Mar-03	32.2
Apr-03	29.2
ANNUAL AVERAGE (10 MONTHS)	23.7

From the graph above (figure 5.5) it can be seen that the highest reading for the 1hr mean for nitrogen dioxide from July 2002 to April 2003 was 120.3 µg/m³ in January 2003 which meets the 1hr standard of 200µg/m³ for 31.12.2005. Table 5.15 above shows that there was a ten-month average of 23.7 µg/m³ for nitrogen dioxide since the Groundhog has been located at manse rd, Whitburn since July 2002, even allowing for seasonal variations. This meets the standard of 40µg/m³ for 31.12.2005.
(See predictions for 2005 on page 32 – calculation no.5)

PREDICTIONS FOR 2005

Estimated annual average NO_2 concentrations for 2005 using correction factors

This has been based on the calculation taken from Box 6.6, page 6-9 of the technical guidance.

Annual average x correction factor

1. *Prediction for 2005 for Linlithgow using Linlithgow 2000 annual average (See table 5.11)*

Linlithgow annual average = **25.9μg/m³**

= 25.9 x (0.892/1.033) = **22.36μg/m³**

The predicted 2005 annual average for Linlithgow High St based on 12-months real-time monitoring in year 2000 is **22.36μg/m³**.

2. *Prediction for 2005 for Linlithgow using Linlithgow January 2001 to 18th May 2001 annual average (See table 5.12)*

The annual average NO_2 concentration for Linlithgow is **29.4μg/m³** based on five months of data in 2001. This period mean is similar to the same period mean for 2000 of the same location. The 2000 period mean from January to May 2000 was 29.8μg/m³ which is very similar and would possibly show a seasonal variation.

Using the 29.4μg/m³ (5month) average the prediction for 2005 would be:

Ratio = Linlithgow 2000 annual average/Linlithgow 01/01/01 to 11/05/01 annual average

= 25.9/29.4 = 0.88 Ratio

= 29.4 x 0.88 = 25.8

= 25.8 x 0.892 = **23.0μg/m³**

This is very similar to the 2000 data based prediction of **22.36μg/m³**

The predicted 2005 annual average for Linlithgow High St based on 5-months real-time monitoring from 01/01/01 to 11/05/01 is **23.0μg/m³**.

3. *Prediction for 2005 for Bathgate using Bathgate May 2001 to November 2001 annual average (See Table 5.13)*

The annual average NO_2 concentration for Bathgate is **18.4μg/m³** based on seven months of data in 2001.

For Linlithgow 2000 for the same period from May to November 2000 the annual average was 22.8μg/m³ (PML)

Linlithgow 2000 annual average = 25.9μg/m³ (AML)

Using the 18.4μg/m³ (7 month) average the prediction for 2005 would be:

AML/PML = 25.9/22.8 = 1.14
Prediction for 2005 = 18.4 x 1.14 x 0.892

= **18.7μg/m³**

The predicted 2005 annual average for The Steelyard, Bathgate based on 7-months real-time monitoring from 18/05/01 to 30/11/01 is **18.7μg/m³**.

4. Prediction for 2005 for Linlithgow using Linlithgow December 2001 to June 2002 annual average (See Table 5.14)

The estimated annual average NO_2 concentration for 2005 is based on real-time monitoring in Linlithgow using December 2001 to June 2002 annual average:

Ratio = Linlithgow 2000 annual average/Dec 2001 to June 2002 annual average

= 25.9/19.6 = 1.32 Ratio Factor

= 19.6 x 1.32 = 25.87μg/m³ estimated 2002 annual average

Prediction for 2005 = 25.87 x 0.892/0.969

= **23.8μg/m³**

This prediction compares with the 2000 & 2001 estimated 2005 annual averages of 22.36μg/m³ & 23.0μg/m³ for Linlithgow.

The predicted 2005 annual average for Linlithgow High St, based on 7-months real-time monitoring from 05/12/01 to 07/06/02 is **23.8μg/m³**.

5. Prediction for 2005 for Whitburn using Whitburn July 2002 to April 2003 annual average (See Table 5.15)

The estimated annual average NO_2 concentration for 2005 is based on real-time monitoring in Whitburn using 10 months data from July 2002 to April 2003.

Annual average = **23.7μg/m³**

= Whitburn annual average x (0.941/0.892)

= 23.7 x (0.941/0.892)

= **25μg/m³**

The predicted 2005 annual average for Manse Rd, Whitburn based on 10-months real-time monitoring from July 2002 to April 2003 is **25μg/m³**.

Based on the real-time monitoring results for Linlithgow, Bathgate and Whitburn town centres there are no predicted annual means greater than 40μg/m³ for 2005.

Questions from Technical Guidance

Narrow congested streets with residential properties close to the kerb

Two of the sites chosen for real-time monitoring of nitrogen dioxide in West Lothian are in this category and are namely Manse Rd, Whitburn and Linlithgow High St.

Are any of the predicted annual means in 2005 greater than 40μg/m³?

No, none of the predicted annual means in 2005 have been predicted to be greater than 40μg/m³
Therefore, a detailed assessment is not considered necessary for Nitrogen dioxide at these locations.

Junctions

The two junctions at Whitburn and Bathgate are in the town centres at traffic light junctions. In Whitburn the site is in a car park just off the junction.

Are any of the predicted annual means in 2005 greater than 40μg/m³?

No, none of the predicted annual means in 2005 have been predicted to be greater than 40μg/m³
Therefore, a detailed assessment is not considered necessary for Nitrogen dioxide at these locations.

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

All three sites chosen in West Lothian for real-time monitoring are in busy streets where people may spend an hour or more close to traffic.

Are any of the predicted annual means in 2005 greater than 40μg/m³?

No, none of the predicted annual means in 2005 have been predicted to be greater than 40μg/m³.
Therefore, a detailed assessment is not considered necessary for Nitrogen dioxide at these locations.

Roads with high flow of buses and/or HGV'S

From the information available from our Highways Dept, there are no roads with unusually high proportions of buses or HGV's.

Are any of the predicted annual means in 2005 greater than 40μg/m³?

No, none of the predicted annual means in 2005 have been predicted to be greater than 40μg/m³.
Therefore, a detailed assessment is not considered necessary for Nitrogen dioxide at these locations.

New roads constructed or proposed since first round of review and assessment

There are no new or proposed roads falling into this category. There are no existing roads with predicted annual mean concentrations of over 36μg/m³ or more than 15 1-hour exceedences of 200μg/m³.

Are any of the predicted annual means in 2005 greater than 40μg/m³?

No, none of the predicted annual means in 2005 have been predicted to be greater than 40μg/m³.
Therefore, a detailed assessment is not considered necessary for Nitrogen dioxide at these locations.

Roads close to the objective during the first round of review and assessment

There are no roads in this category in West Lothian.

Roads with significantly changed traffic flows

There are no roads in West Lothian that have experienced large increases in traffic. Linlithgow High St has shown a slight decrease in traffic flow year on year from 1999 to 2002 from 17,773 to 16,882 AADT.

Are any of the predicted annual means in 2005 greater than 40μg/m³?

No, none of the predicted annual means in 2005 have been predicted to be greater than 40μg/m³.
Therefore, a detailed assessment is not considered necessary for Nitrogen dioxide at these locations.

Bus Stations

There are no Bus Stations in West Lothian that meet with these parameters.

New Industrial Sources

From the information available and checking with SEPA there are no new industrial sources in West Lothian.

Industrial Sources with substantially increased emissions

From the information supplied by SEPA there are no industrial sources with substantially increased emissions.

Aircraft

This is not applicable to West Lothian as there is not an airport in West Lothian.

CONCLUSION FOR NITROGEN DIOXIDE

The three real-time monitoring locations were chosen after initial diffusion tube screening surveys identified the busy town centre areas as requiring real-time monitoring. The sites at Bathgate and Whitburn are located near to traffic light junctions in the town centres. Bathgate and Whitburn are the two largest populated towns outwith Livingston in West Lothian. In addition, the Whitburn site is located in a car park just off the traffic light junction making it the worst case example as cars often sit in the car park with engines running and deliveries for some shops in West Main St, Whitburn are made via the car park.
The Linlithgow site was chosen because the diffusion tube survey showed some of the highest NO_2 levels in the area. The measured NO_2 concentrations at both real-time and diffusion tube sites and the predictions based on the real-time monitoring at the three Groundhog monitoring locations indicate that there have been no exceedences of the 1-hour mean of 200µg/m³. The 2005 annual mean objective of 40µg/m³ is currently being achieved and is predicted to be achievable in 2005.
There is no requirement to proceed to a detailed assessment.

CHAPTER 6

REVIEW AND ASSESSMENT FOR PM_{10}

INTRODUCTION

Particulate Matter, PM_{10} is defined as particles, whatever their source or composition, which fall within the appropriate size range. Particles which are smaller than 10μm in diameter are more likely to reach the lung and therefore, the mass fraction of these particles are known as PM_{10}.

In the U.K there are a wide range of emission sources that contribute to PM_{10} and these sources can be divided into three main categories.
Primary particle emissions are derived from combustion sources, including road traffic, power generation and industrial sources. Secondary particles are formed by chemical reactions in the atmosphere and consist 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.

Standard and Objective for PM_{10}

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

24-hour mean of 50μg/m³ not to be exceeded more than 35 times a year to be achieved by 31.12.2004

Annual mean of 40μg/m³ to be achieved by 31.12.2004

For Local Authorities in Scotland only there are two objectives for 2010:-

24-hour mean of 50μg/m³ not to be exceeded more than 7 times a year to be achieved by 31.12.2010

Annual mean of 18μg/m³ to be achieved by 31.12.2010

MONITORING DATA RESULTS: 2000 TO 2003

In West Lothian PM_{10} is measured using a TEOM analyser in the mobile air-quality monitoring unit and has been located at three sites in West Lothian. The three sites are High St, Linlithgow, The Steelyard, Bathgate and the public car park at Manse Rd, Whitburn.
The locations chosen for the Groundhog are all busy areas. The sites at The Steelyard, Bathgate and Manse Rd, Whitburn are located in town centres and close to Traffic Lights. At Manse Rd, Whitburn the Groundhog is located in a car park which is the worst case scenario with slow moving traffic and cars sitting at traffic lights and deliveries for some shops in West Main St, Whitburn are made via the car park.
In addition, in West Lothian, since November 2001 there have been two Osiris units located at Whitehill Industrial Estate, Blackburn and Standhill Cottages, Bathgate and since September 2002 there has been an Osiris unit located at Polkemmet Primary School, Whitburn. An Osiris unit is an environmental dust monitor and is a portable instrument designed to continuously monitor and record PM1, PM2.5, PM_{10} and Total particle concentrations and can also measure accompanying wind speed and direction.
The Osiris units are presently being used for specific projects and are measuring background concentrations of dust & PM_{10} particles. Conditions requiring real-time monitoring of PM_{10} and total dust are to be conditions to any planning permission being granted for the rehabilitation of Riddochill and Polkemmet Bings. The Osiris units are not being used to measure Local Air Quality.

The following graphs show the results for PM_{10} at the three sites the Groundhog (real-time analyser) has been located at and show the 24-hour mean. The PM_{10} results from the TEOM have been converted into gravimetric concentrations by multiplying the results by the1.3 default factor.

PM_{10} RESULTS – LINLITHGOW HIGH ST - YEAR 2000

Figure 6.1 – Linlithgow High St - January 2000

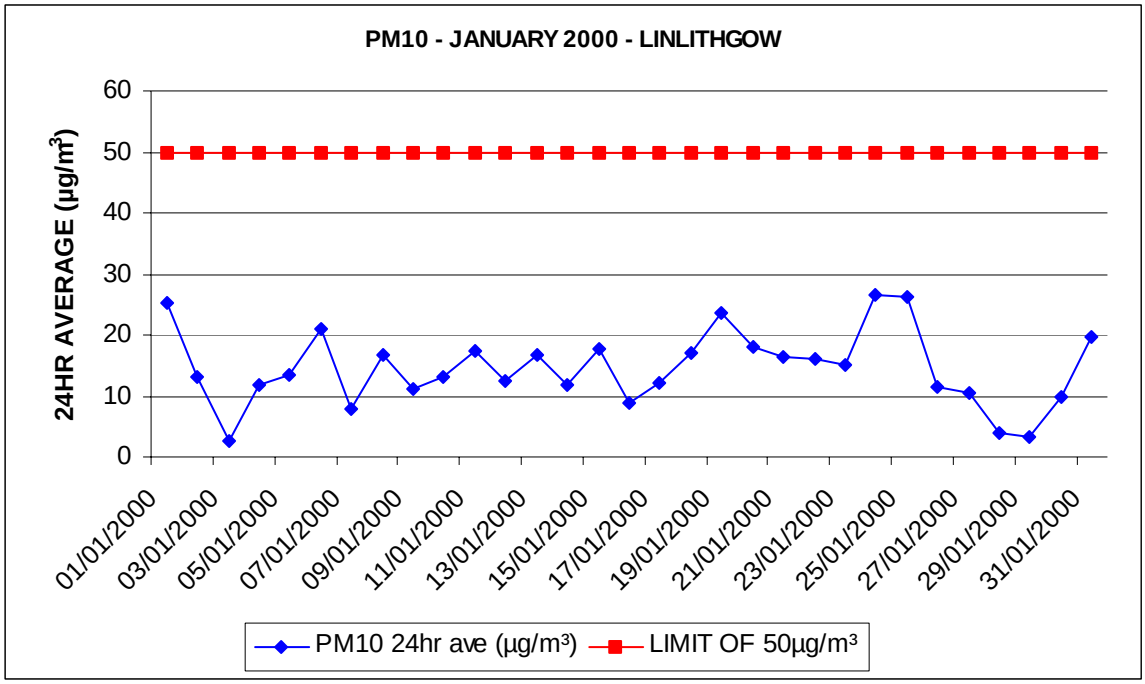


Figure 6.2 – Linlithgow High St - February 2000

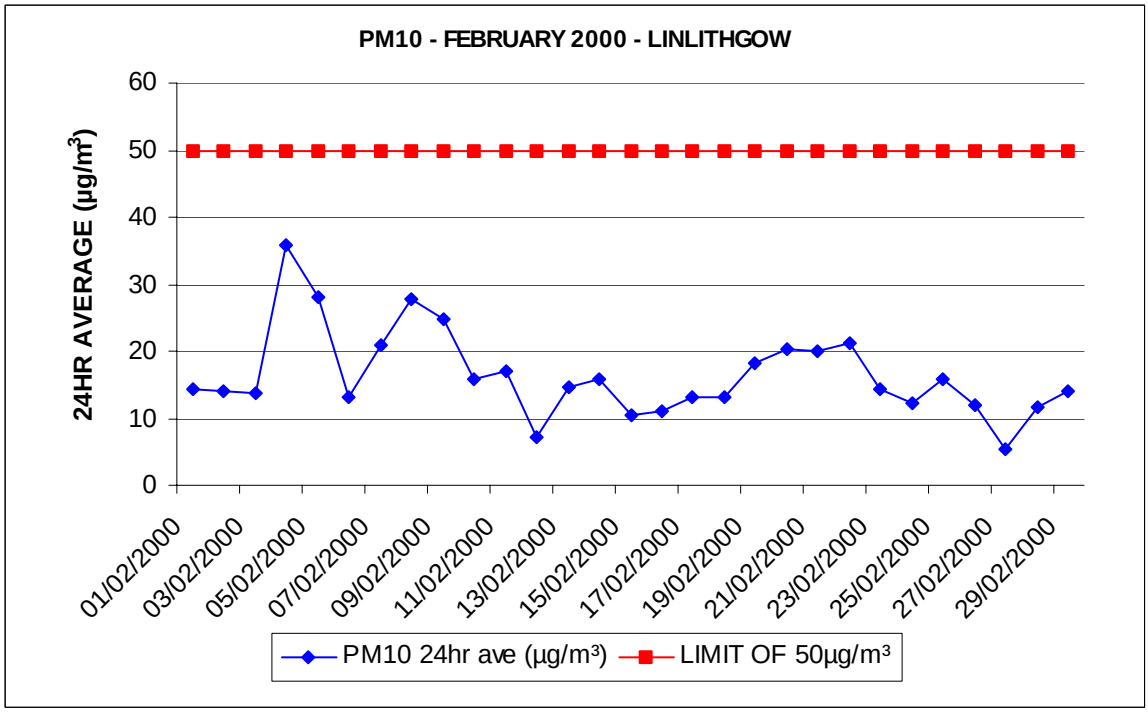


Figure 6.3 – Linlithgow High St - March 2000

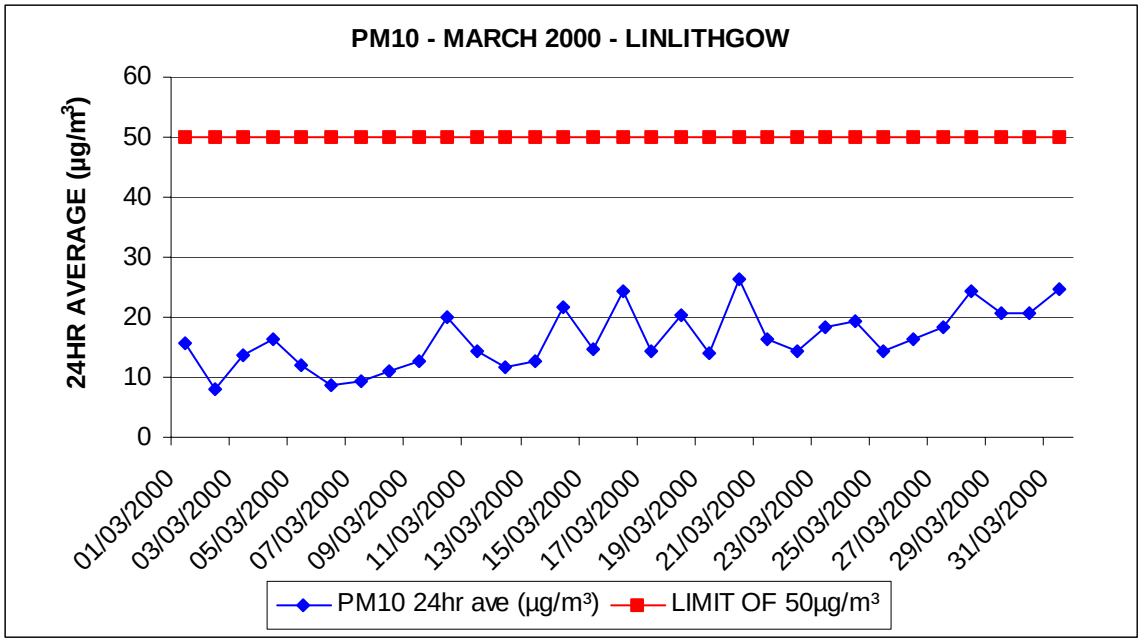


Figure 6.4 – Linlithgow High St – April 2000

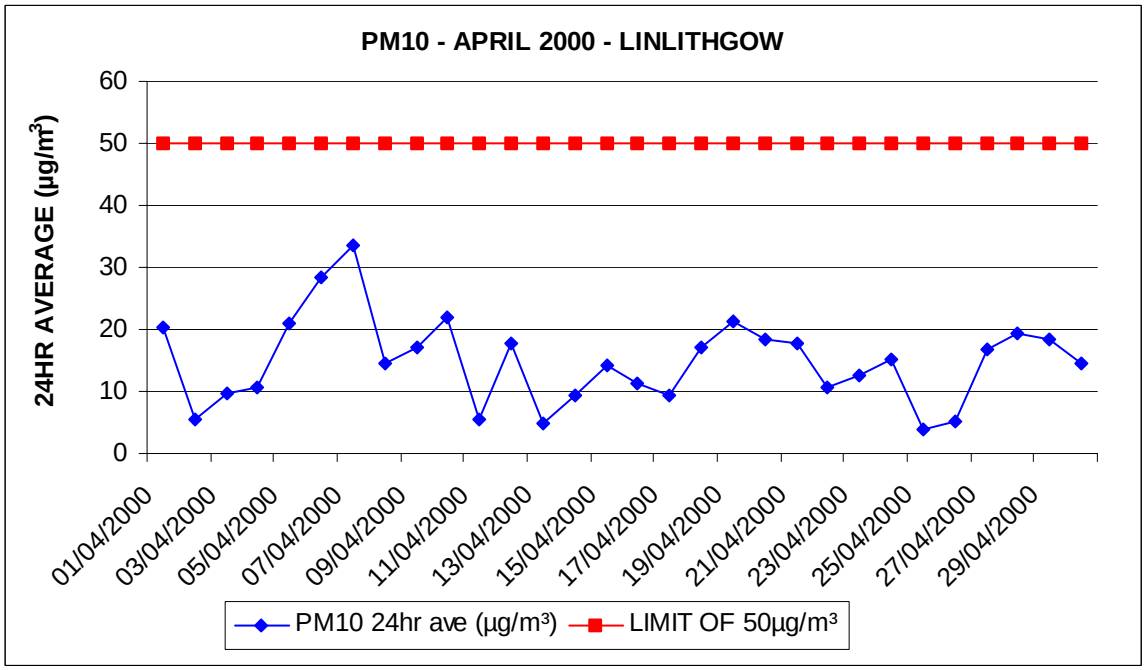


Figure 6.5 – Linlithgow High St – May 2000

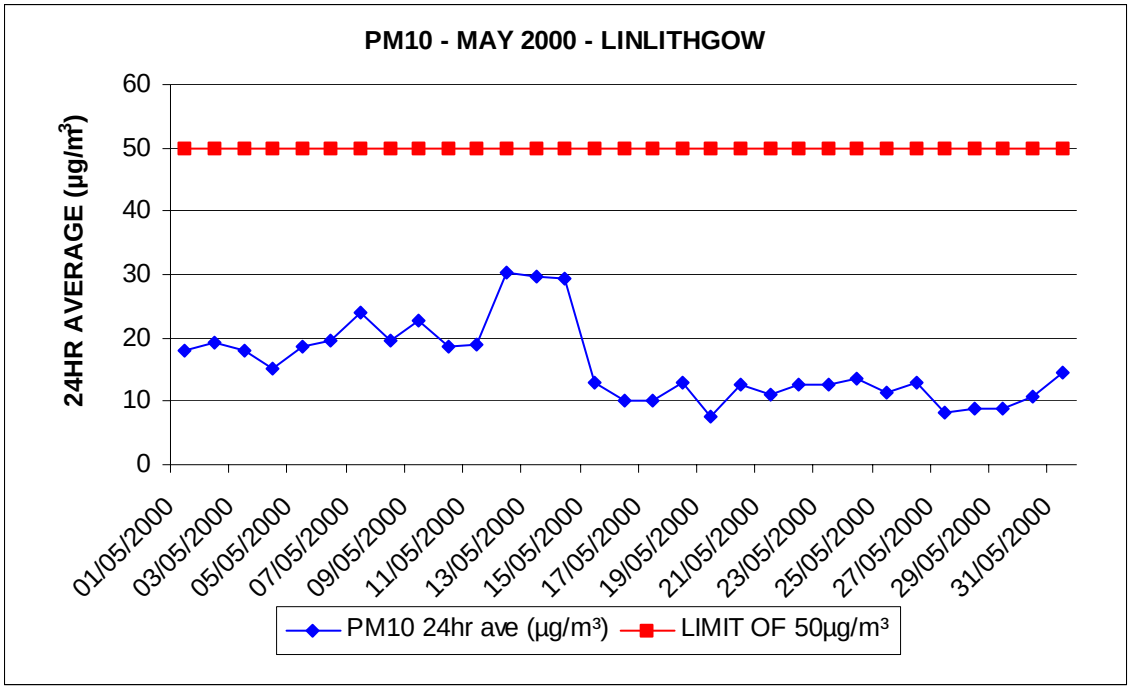


Figure 6.6 – Linlithgow High St – June 2000

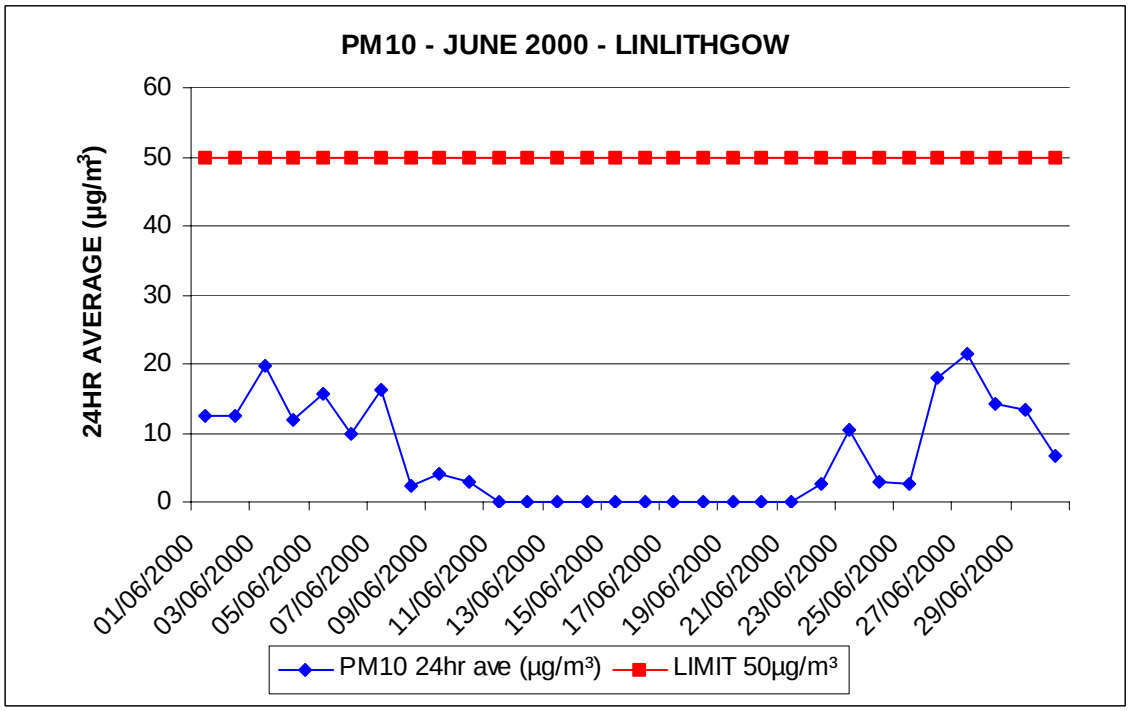


Figure 6.7 – Linlithgow High St – July 2000

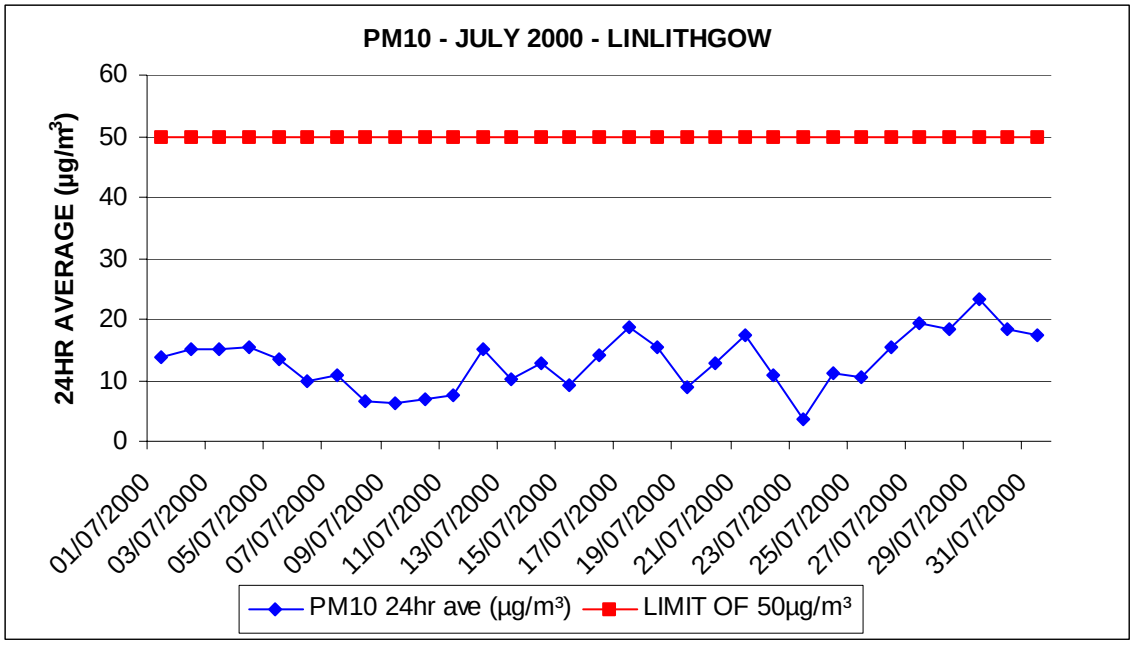


Figure 6.8 – Linlithgow High St – August 2000

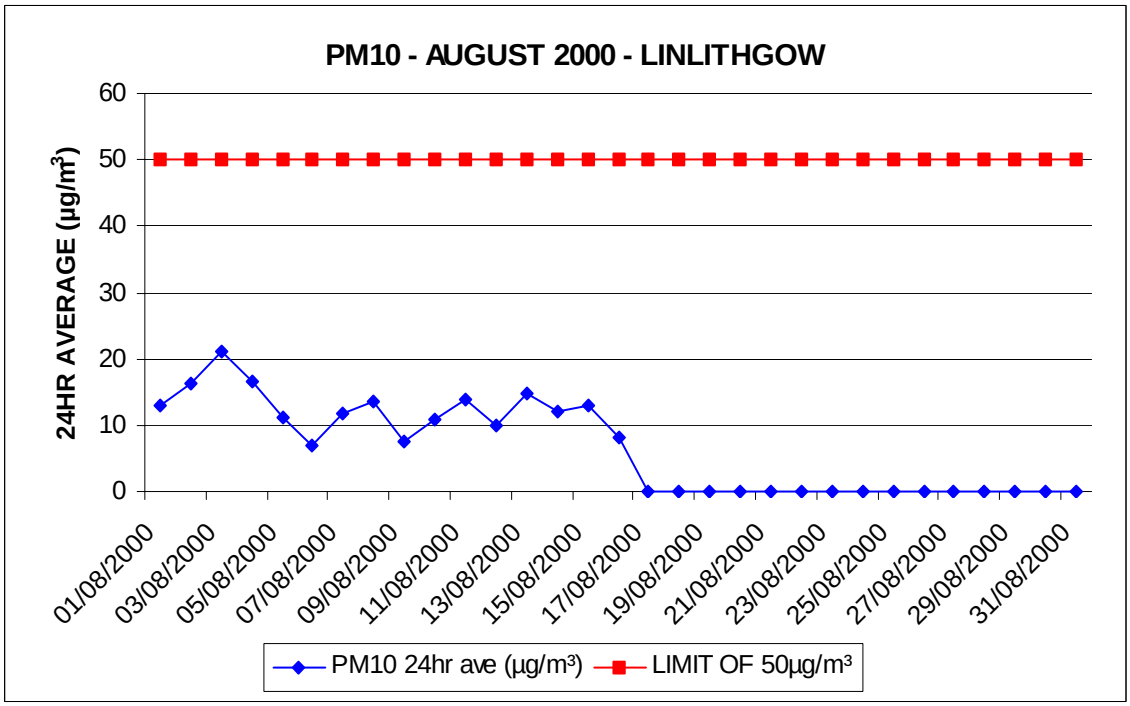


Figure 6.9 – Linlithgow High St – September 2000

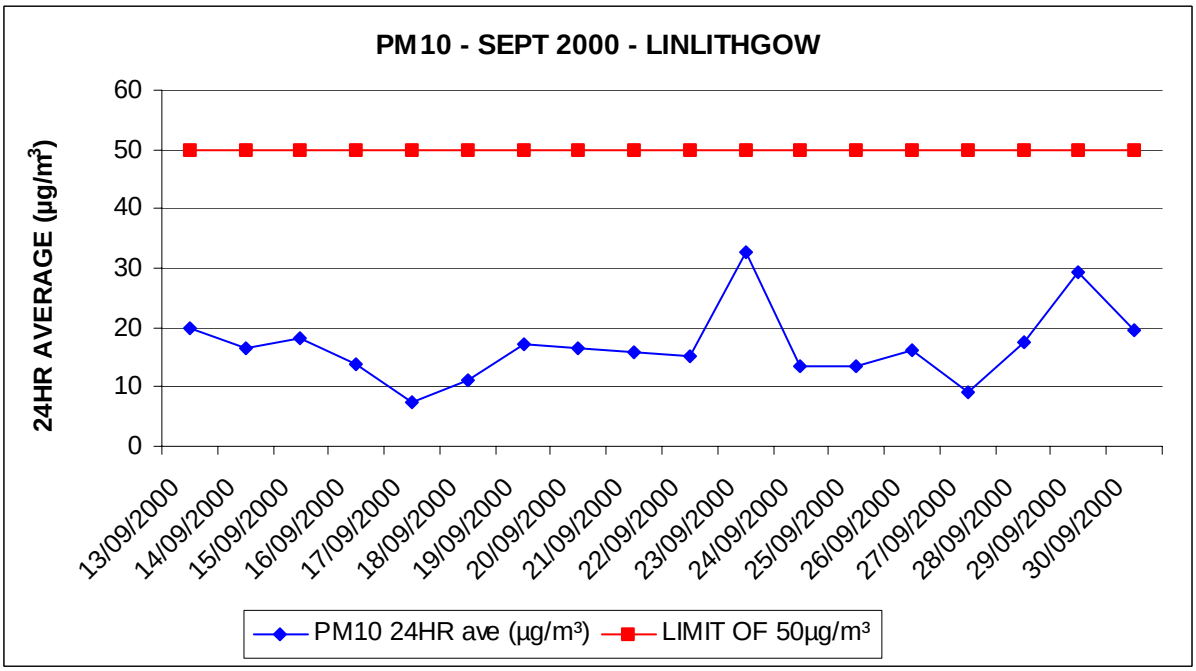


Figure 6.10 – Linlithgow High St – October 2000

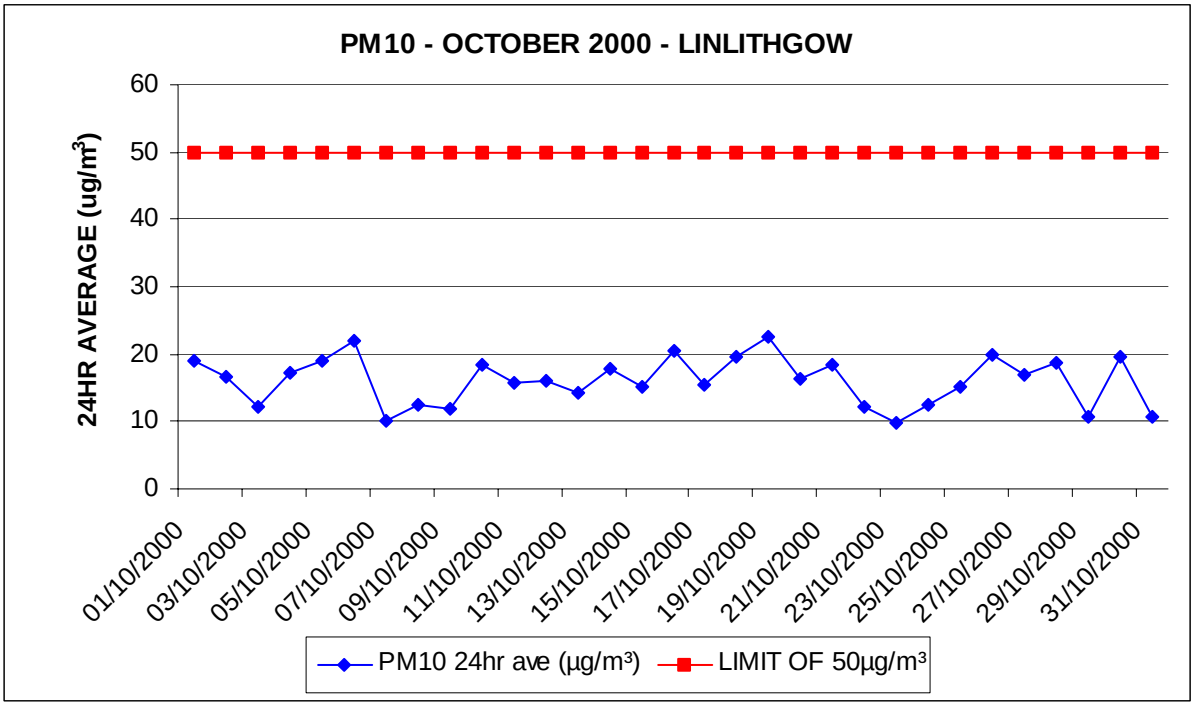


Figure 6.11 – Linlithgow High St – November 2000

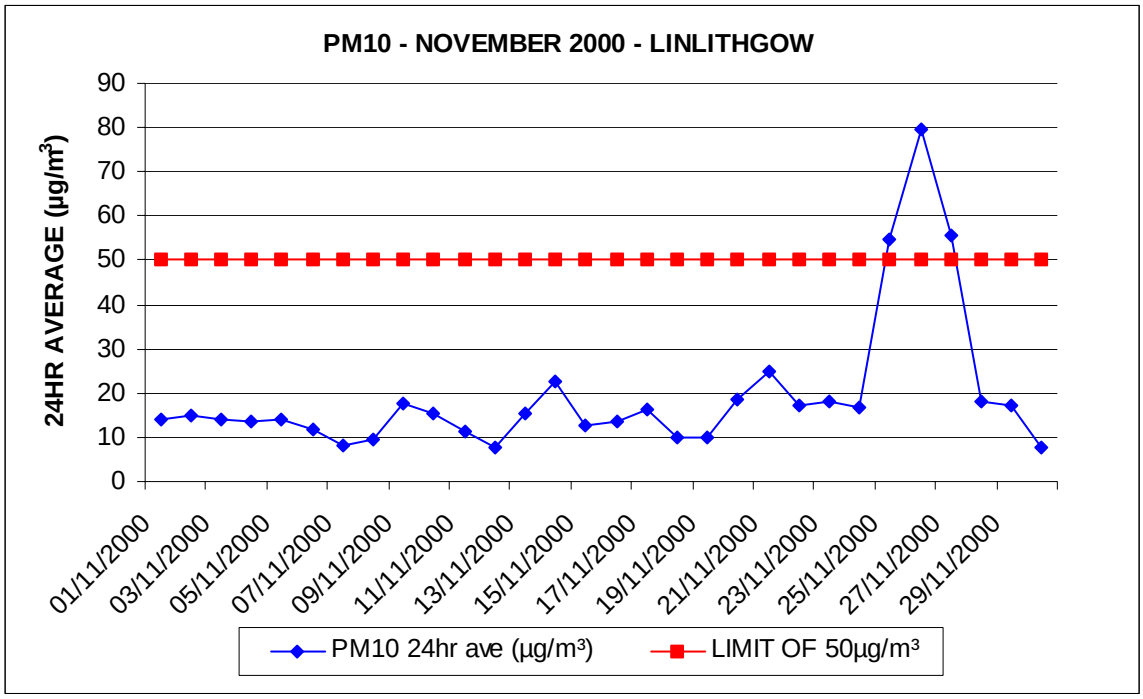
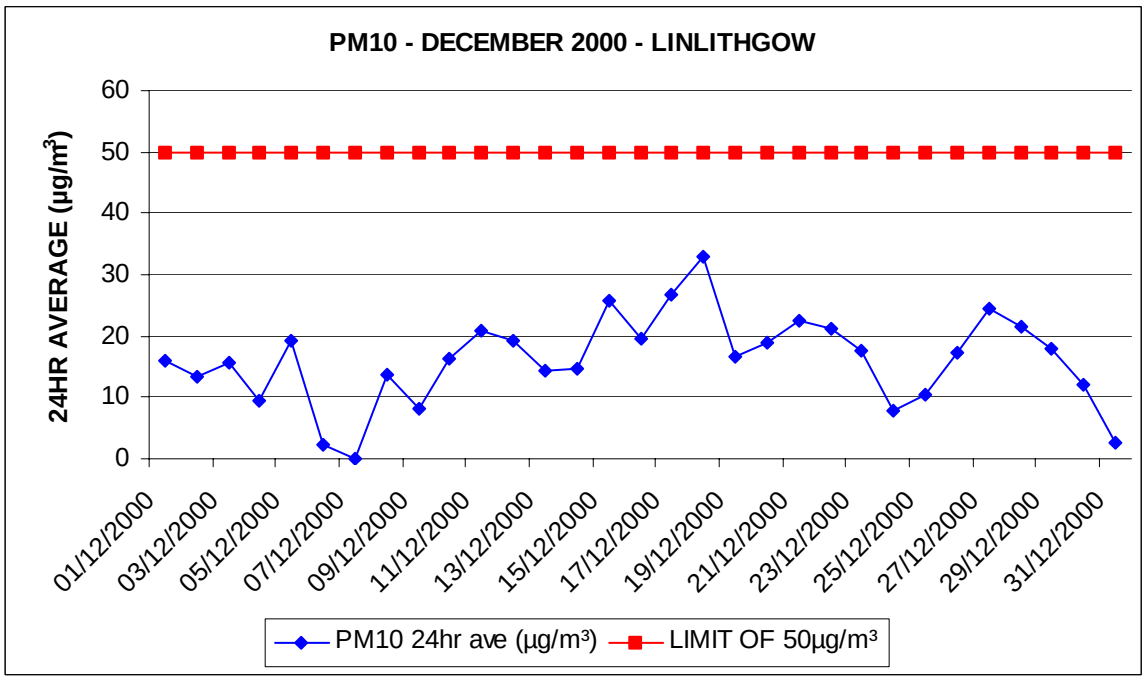


Figure 6.12 – Linlithgow High St – December 2000



PM_{10} - Linlithgow 2000 – Monthly & Annual Average

It can be seen from the graph (fig 6.11) that there were three 24-hour exceedences in November 2000. The first exceedence of 54.7μg/m³ occured on the 25th November 2000, an exceedence of 79.8μg/m³ occured on the 26th November 2000 and an exceedence of 55.7μg/m³ occured on the 27th November 2000. However this still meets the 24-hour objective for 2004 & 2010.

Table 6.1 - monthly and annual averages for PM_{10} – YEAR 2000

MONTHLY AVERAGE	PM_{10} (μg/m³)
Jan-00	14.5
Feb-00	16.4
Mar-00	16.5
Apr-00	14.9
May-00	15.9
Jun-00	6.7
Jul-00	13
Aug-00	6.5
Sep-00	16.9
Oct-00	16
Nov-00	19.4
Dec-00	16.1
ANNUAL AVERAGE	14.4

Table 6.1 above shows that there was an annual average in 2000 of 14.4μg/m³, which meets the standards of 40μg/m³ for 2004 & 18μg/m³ for 2010. Unfortunately, no other data was available to ascertain if the exceedences were due to Secondary PM_{10} or local traffic pollution as the Osiris units were not available until after this time.

In 2001, the Groundhog remained in Linlithgow until 11/05/01 before being moved to The Steelyard, Bathgate. It was intended to move the Groundhog earlier but delays in power supply, telecoms, etc hindered progress.

PM_{10} RESULTS – LINLITHGOW HIGH ST – 01/01/01 TO 11/05/01

Figure 6.13 – Linlithgow High St – January 2001

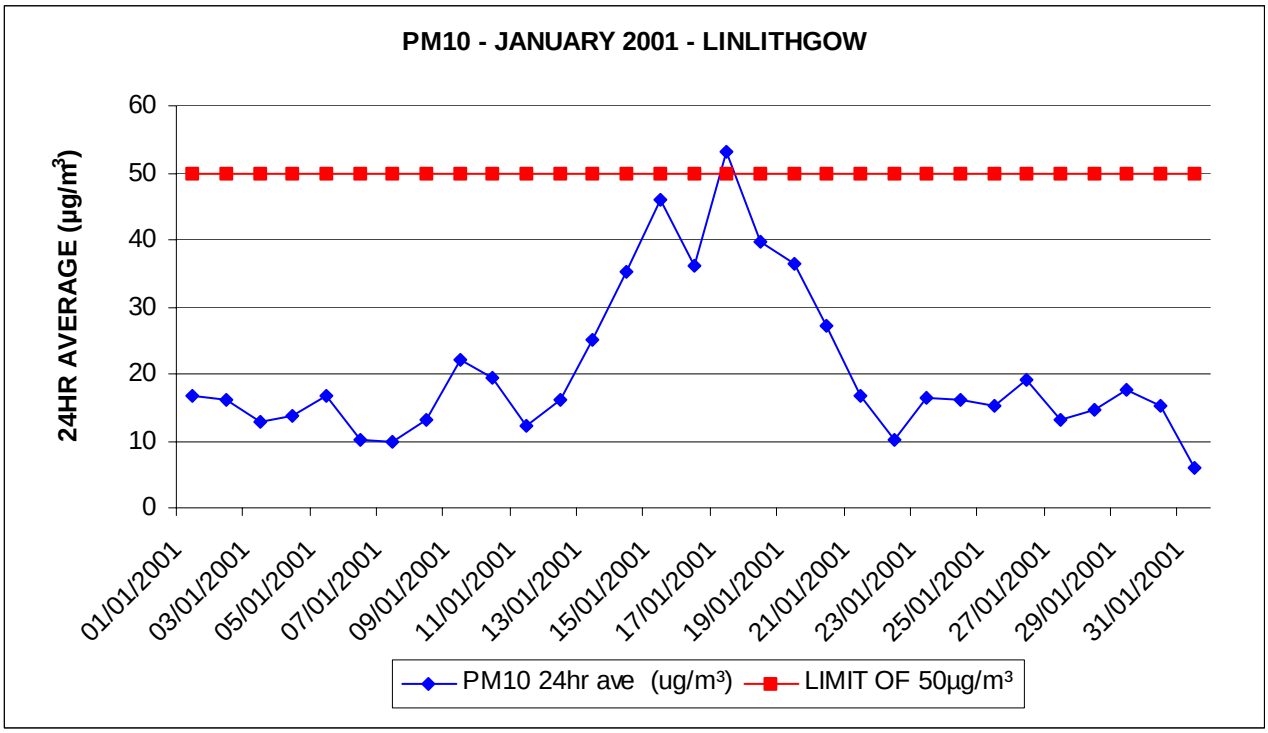


Figure 6.14 – Linlithgow High St – February 2001

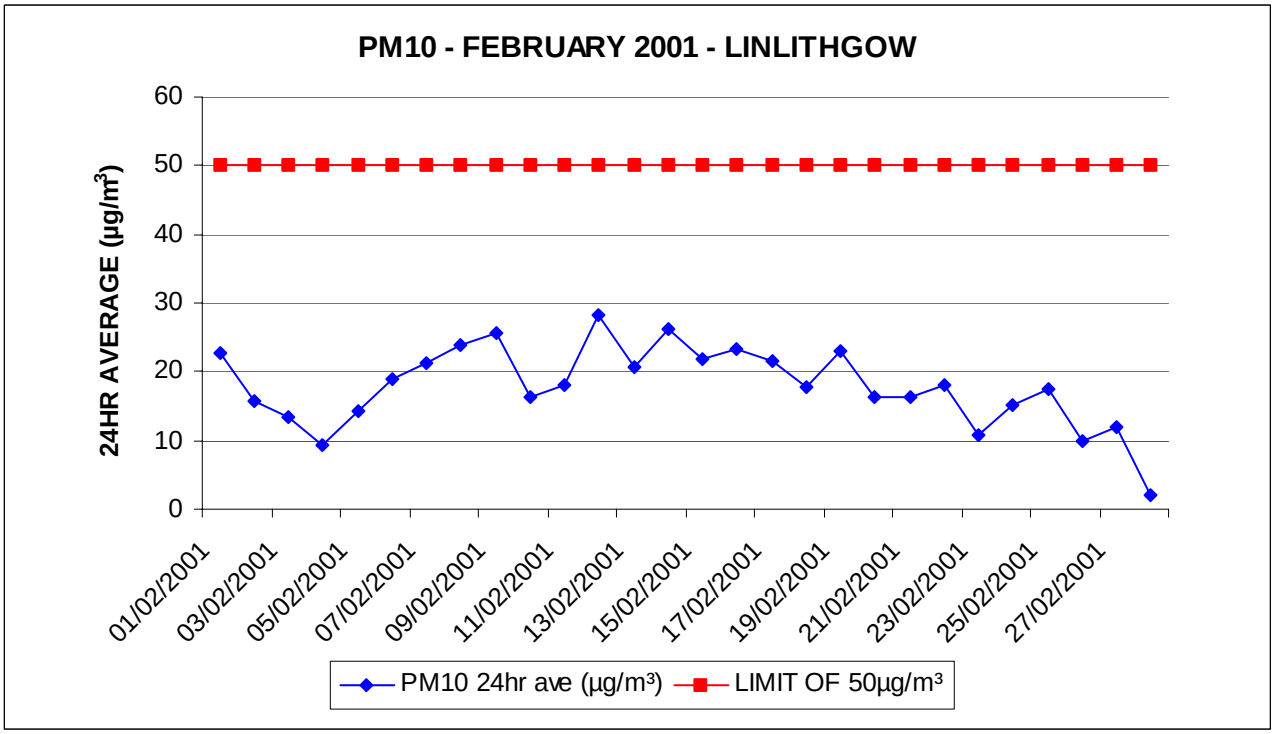


Figure 6.15 – Linlithgow High St – March 2001

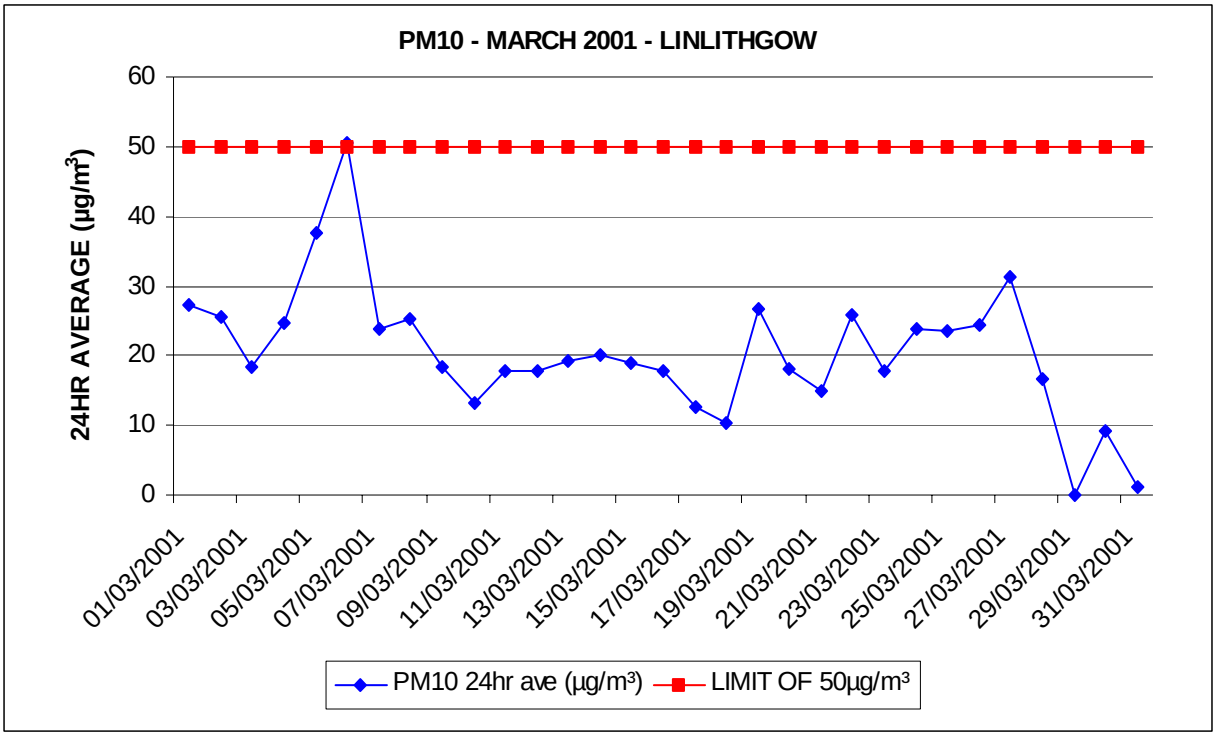


Figure 6.16 – Linlithgow High St – April 2001

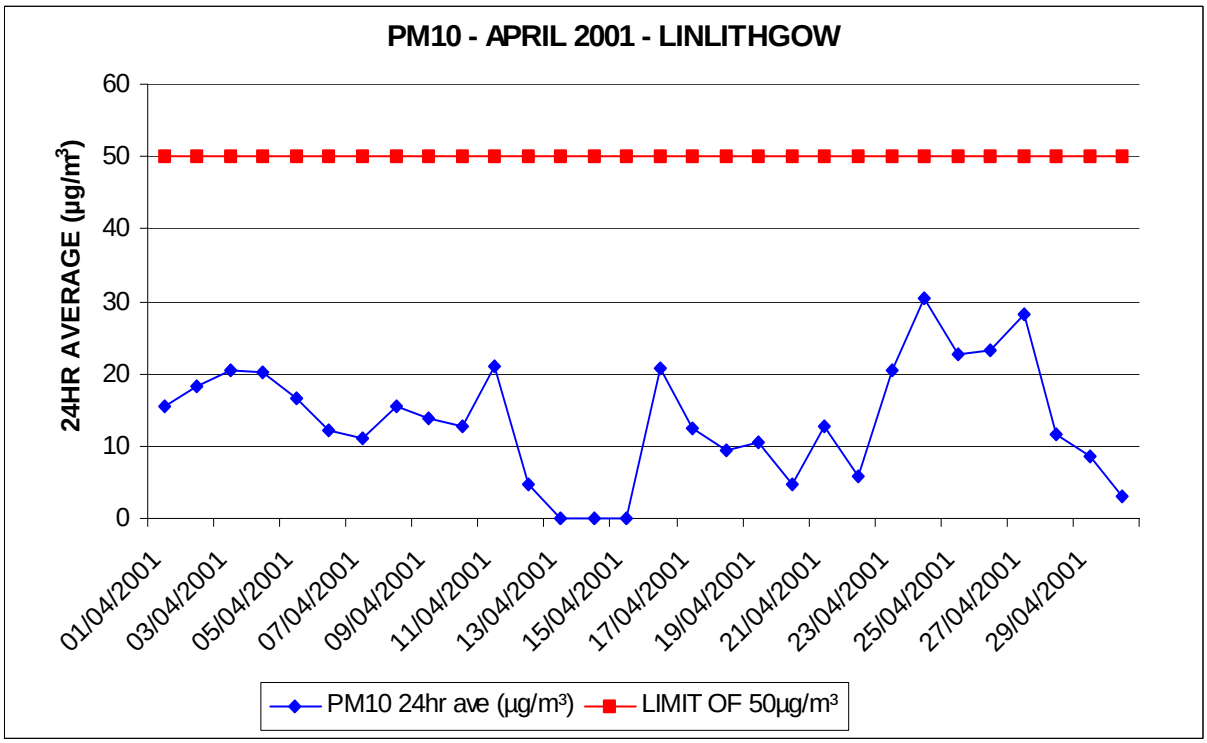
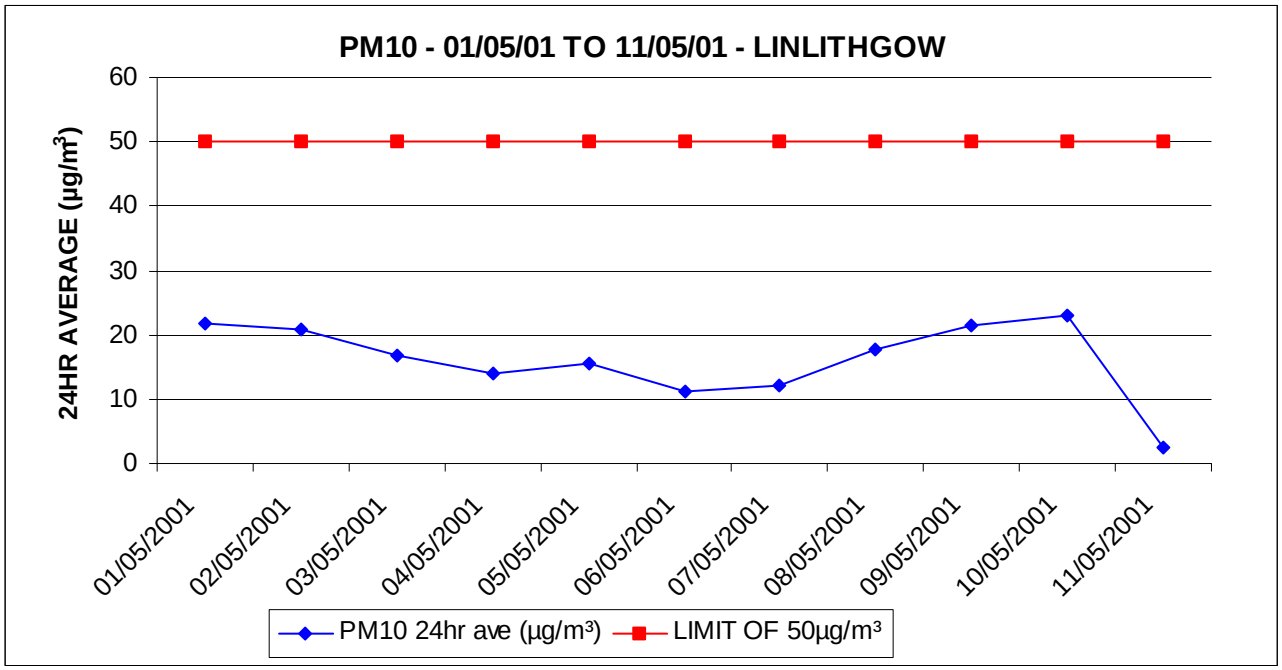


Figure 6.17 – Linlithgow High St – 1st May to 11th May 2001



PM_{10} – Linlithgow – 01/01/01 to 11/05/01 – Monthly & Annual Average

It can be seen from the graphs (figs 6.13 & 6.15) that there were two 24-hour exceedences when the air-quality unit was located at Linlithgow High St from 1st January 2001 to 11th May 2001. The first exceedence of 53.2µg/m³ was on the 17th January 2001 and the second exceedence of 50.4µg/m³ was on the 6th March 2001. This still meets the 24-hour standard for 2004 of 35 exceedences of 50µg/m³ & the 24-hour standard for 2010 of 7 exceedences of 50µg/m³ but is only based on five months data. Unfortunately, no other data was available to ascertain if the exceedences were due to Secondary PM_{10} or local traffic pollution as the Osiris units were not available until after this time.

Table 6.2 – Monthly and Annual Average – January 2001 to 11th May 2001

MONTHLY AVERAGE	PM_{10} (µg/m³)
Jan-01	20.6
Feb-01	17.9
Mar-01	20.4
Apr-01	13.5
May-01	16.1
ANNUAL AVERAGE (5 MONTHS)	17.7

Table 6.2 above shows that there was a five month average of 17.7µg/m³, which meets the annual standard of 40µg/m³ to be achieved by 2004.

The Groundhog moved to The Steelyard, Bathgate a few months behind schedule and unfortunately could only remain in Bathgate until the end of November as the area is used at Christmas time for the Christmas tree and other festive activities.

PM_{10} RESULTS – THE STEELYARD, BATHGATE – 18/05/01 TO 30/11/01

Figure 6.18 – The Steelyard, Bathgate – 18th May to 30th May 2001

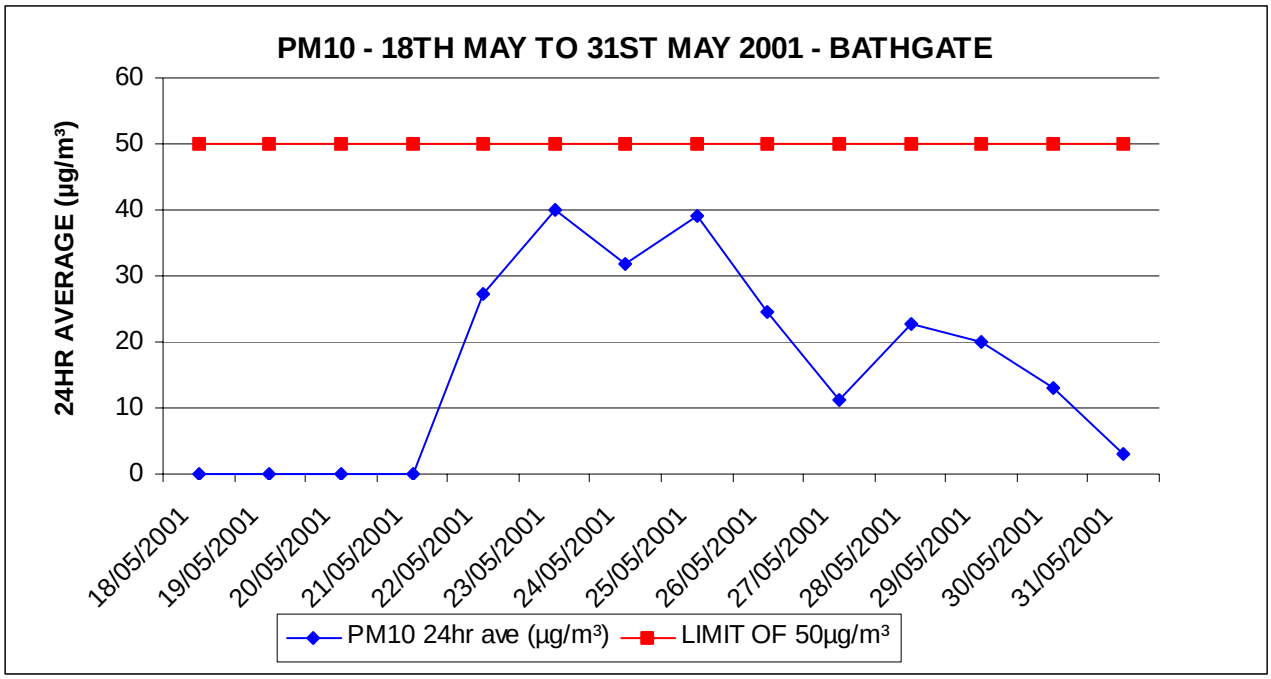


Figure 6.19 – The Steelyard, Bathgate – June 2001

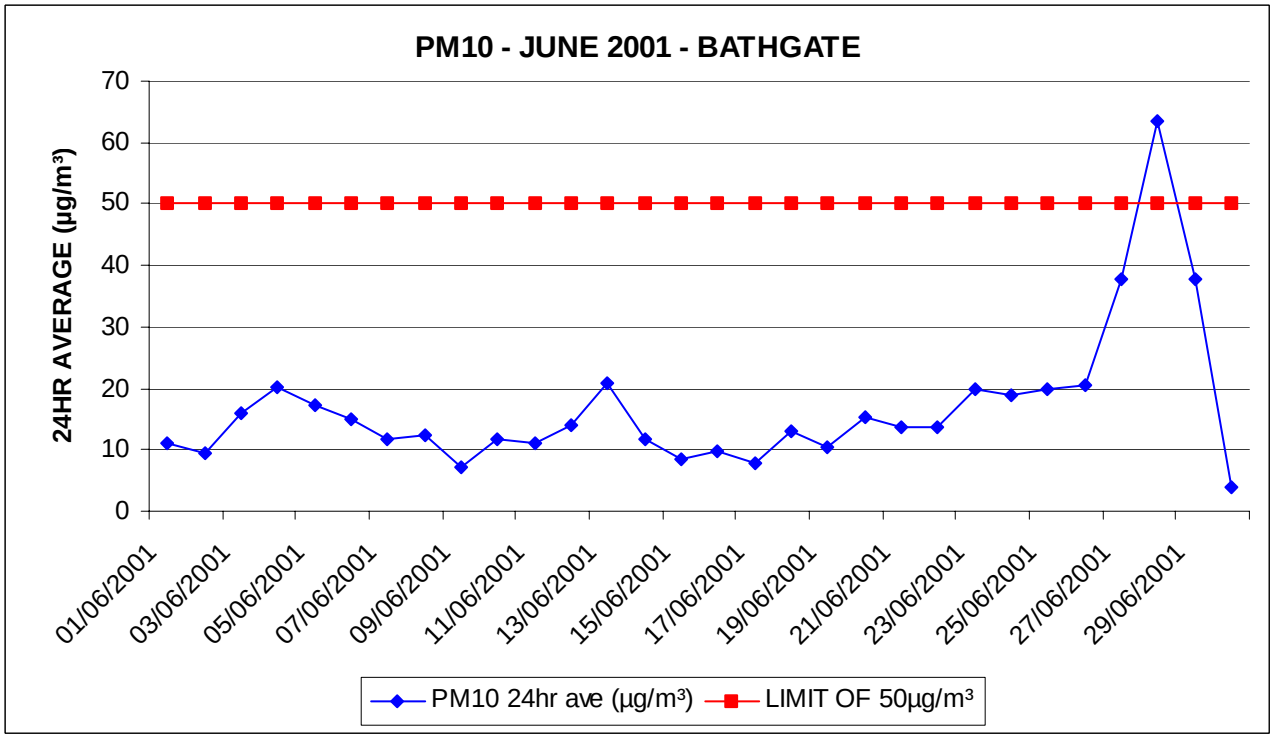


Figure 6.20 – The Steelyard, Bathgate – July 2001

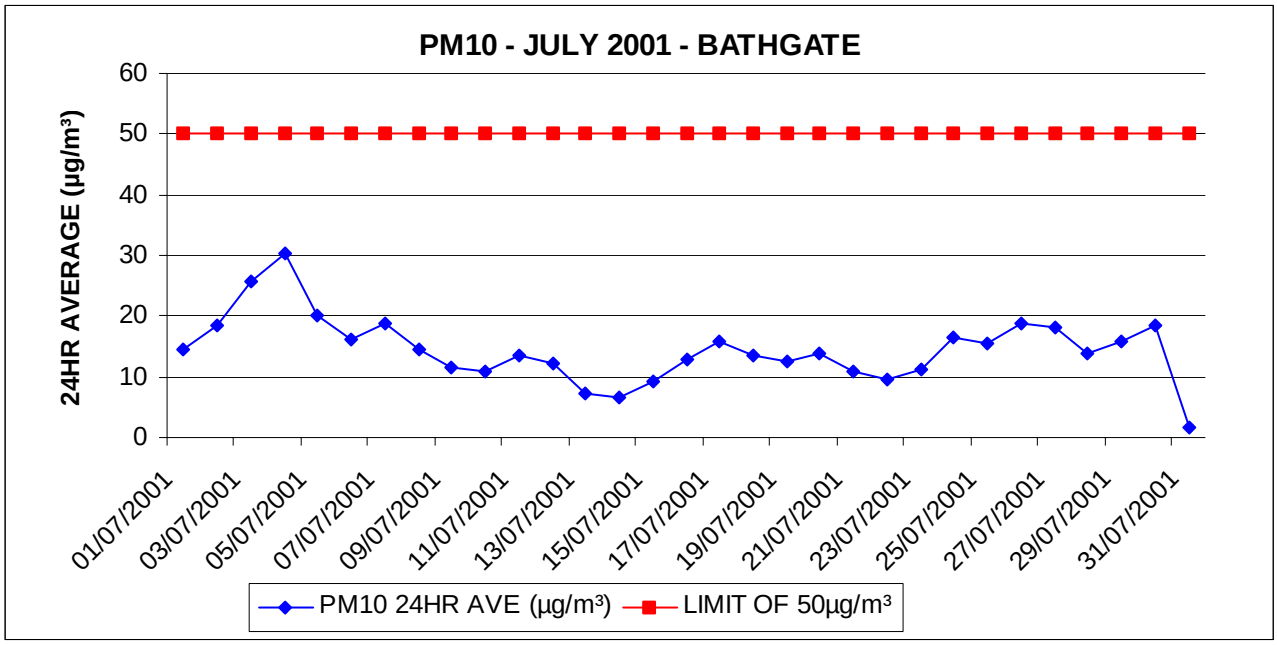


Figure 6.21 – The Steelyard, Bathgate – August 2001

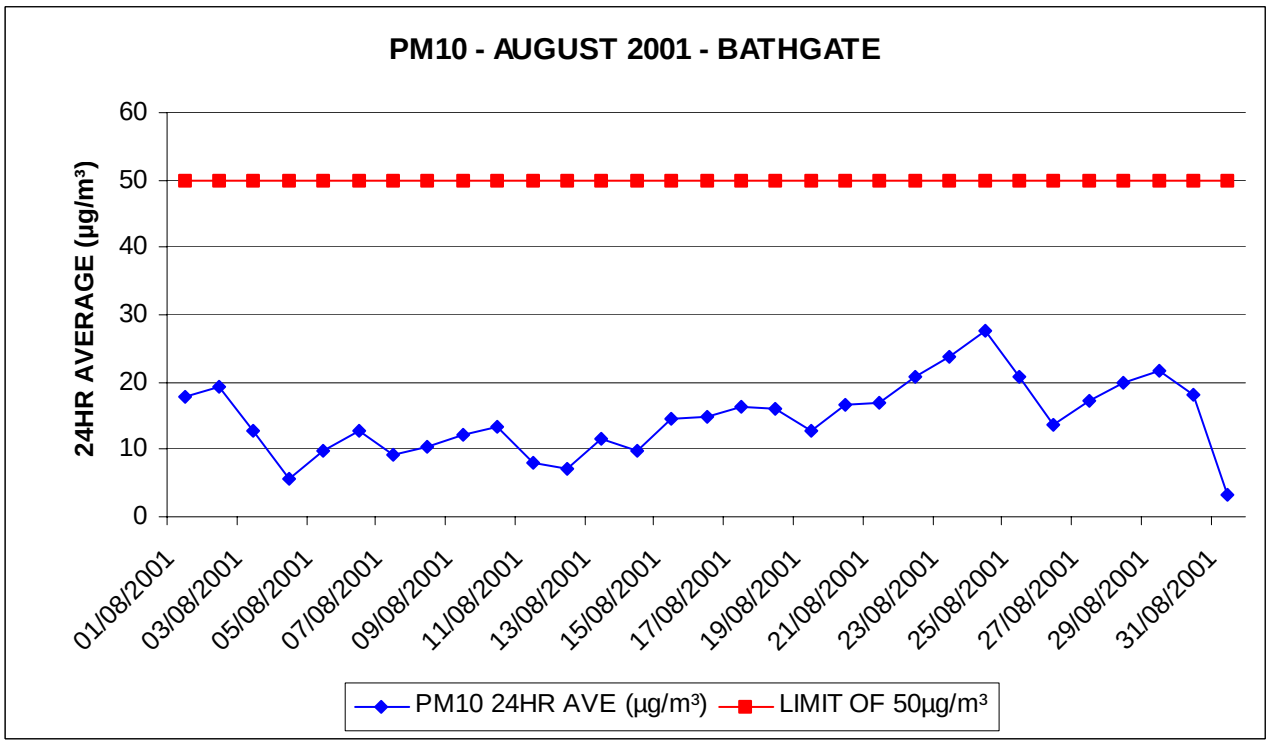


Figure 6.22 – The Steelyard, Bathgate – September2001

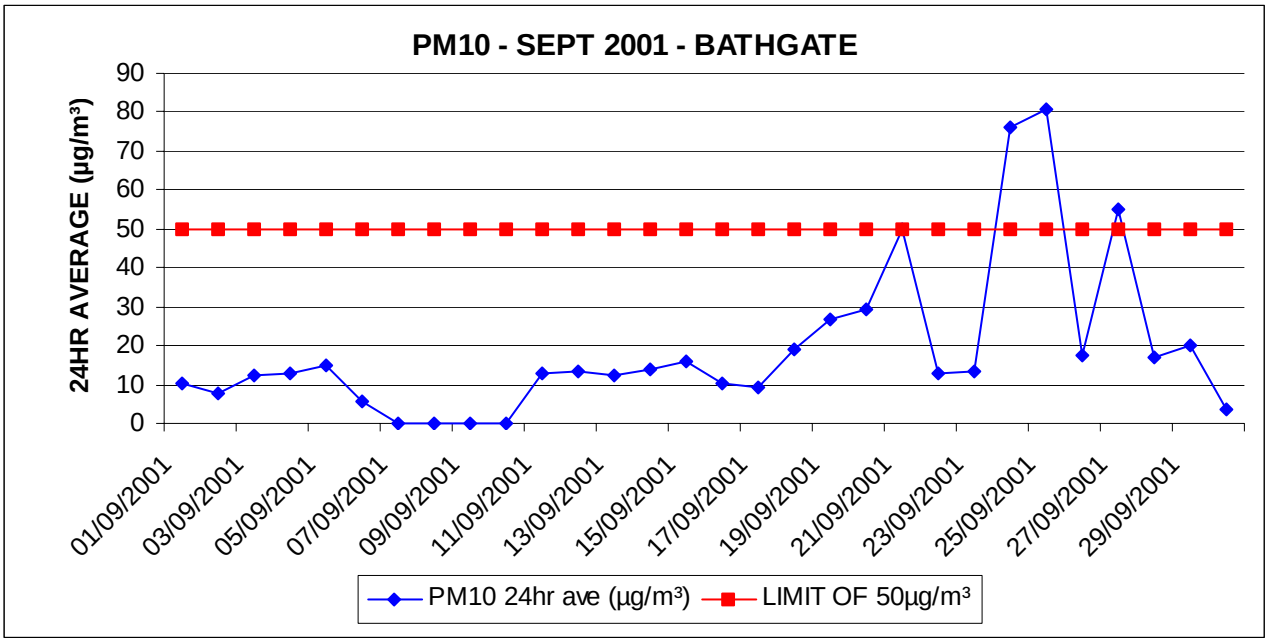


Figure 6.23 – The Steelyard, Bathgate – October2001

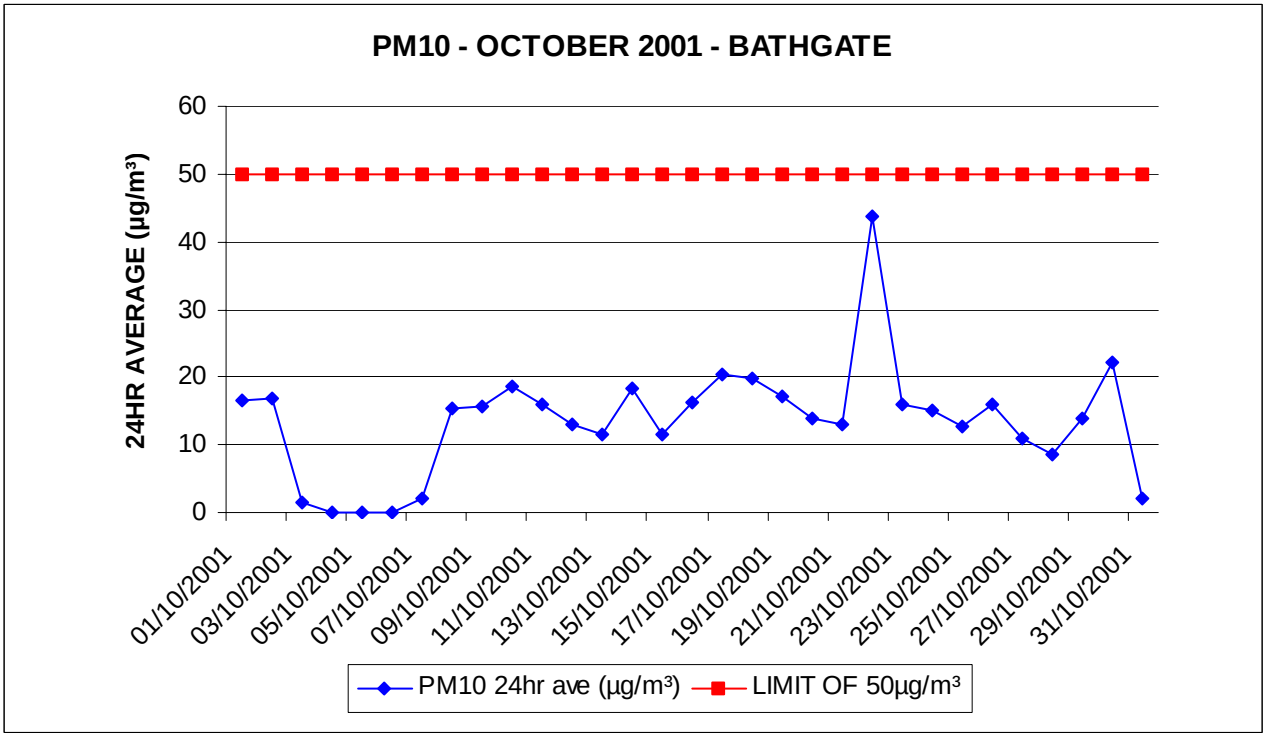
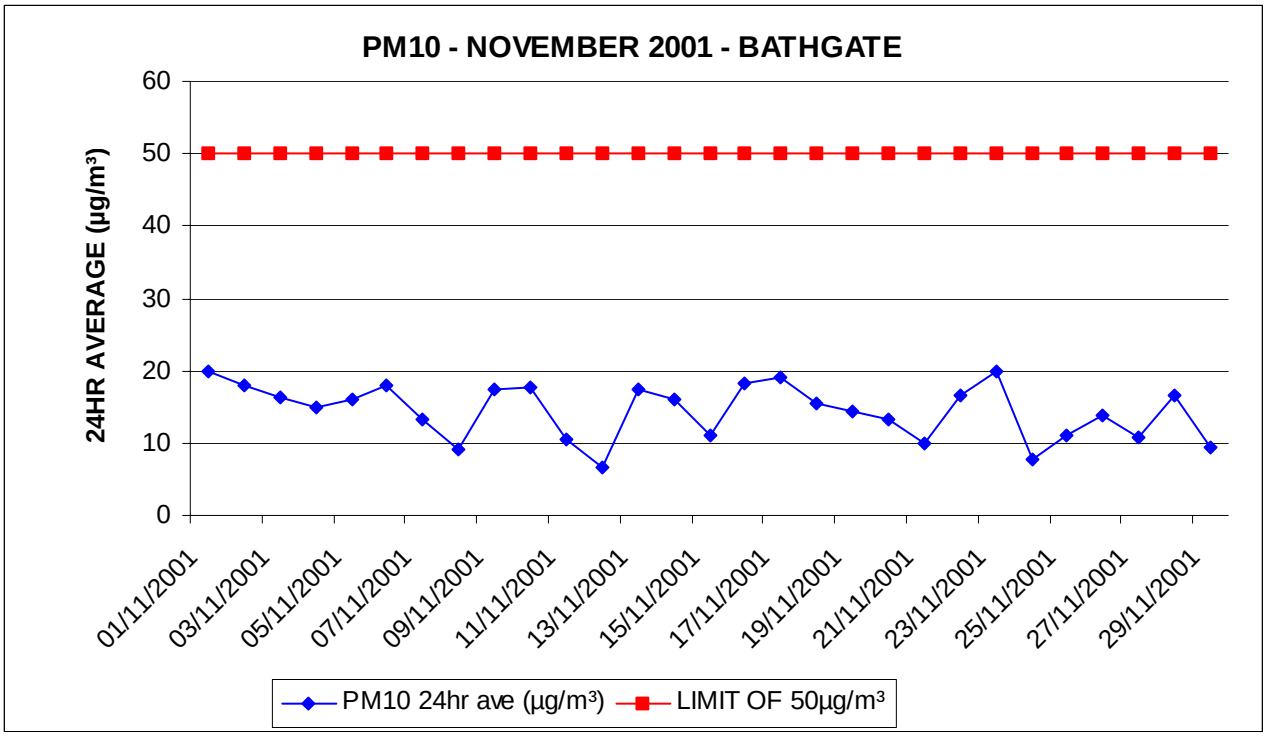


Figure 6.24 – The Steelyard, Bathgate – November2001



PM_{10} – Bathgate – 18/05/01 to 30/11/01 – Monthly & Annual Average

It can be seen from the graphs (figs 6.19 & 6.22) when the Groundhog (air-quality unit) was located in Bathgate there were four 24-hour exceedences. On the 28th of June 2001 there was an exceedence of 63.4μg/m³. On the 24th, 25th and 29th of September 2001 there were exceedences of 76.0μg/m³, 80.6μg/m³ and 55.3μg/m³. However, these exceedences in September were due to the demolition of the Department store building, which, was located, only 15 to 20 metres from the Groundhog. The implementation of a QA/QC system allowed the identification of these exceedences.

Table 6.3 – Monthly and Annual Average – 18th May 2001 to 30th November 2001

MONTHLY AVERAGE	PM_{10} (μg/m³)
May-01	**16.6**
Jun-01	**16.8**
Jul-01	**14.4**
Aug-01	**14.7**
Sep-01	**19.1**
Oct-01	**13.5**
Nov-01	**14.4**
ANNUAL AVERAGE (7 MONTHS)	**15.6**

Table 6.3 above shows that there was a seven-month average of 15.6μg/m³ when the Groundhog was located in Bathgate and this meets the annual standard of 40μg/m³ to be achieved by 2004.

The Groundhog was then returned to its location at High St, Linlithgow until permission for a suitable site could be arranged in Whitburn town centre.

PM_{10} RESULTS – LINLITHGOW HIGH ST – 05/12/01 to 07/06/02

Figure 6.25 – Linlithgow High St – 5th December 2001 to 31st December 2001

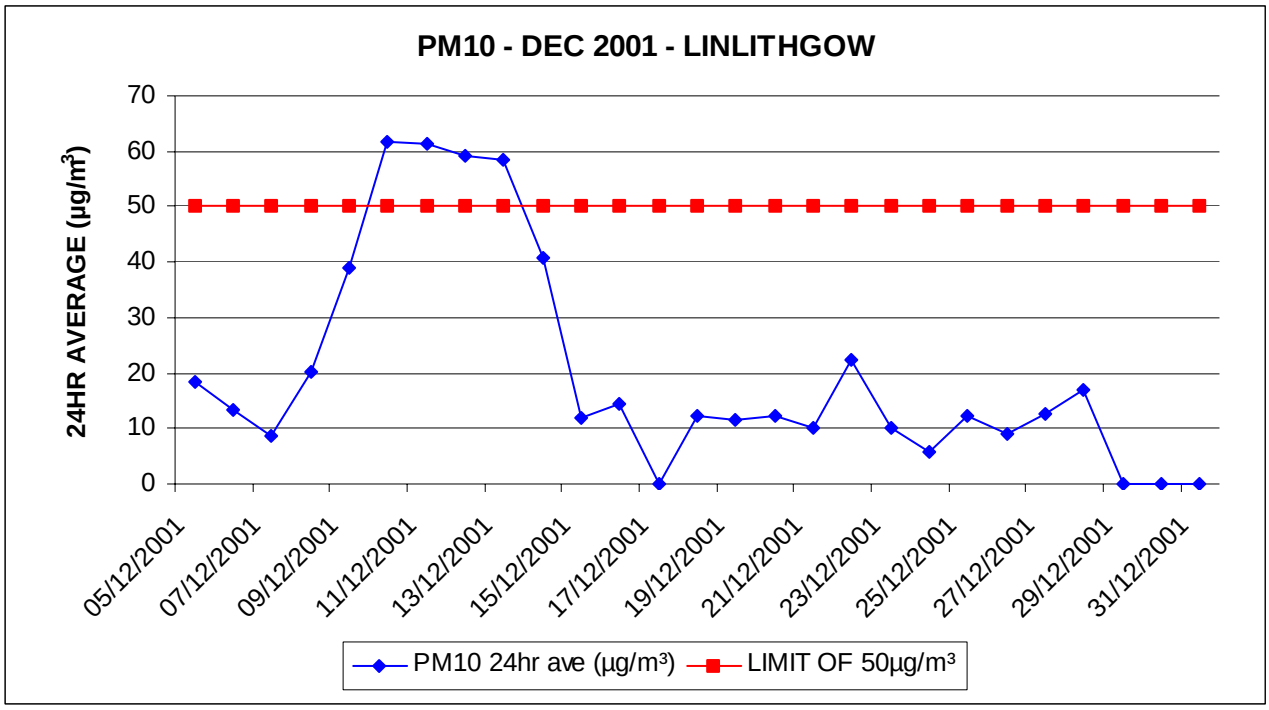


Figure 6.26 – Linlithgow High St – January 2002

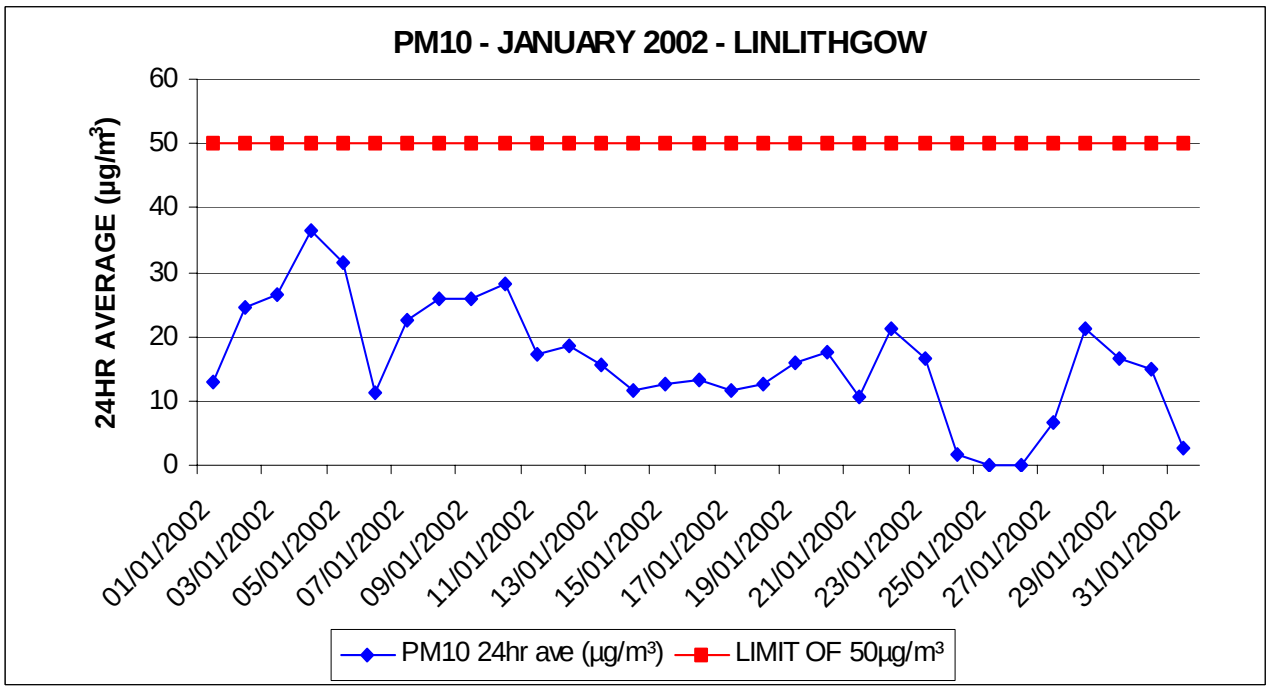


Figure 6.27 – Linlithgow High St – February 2002

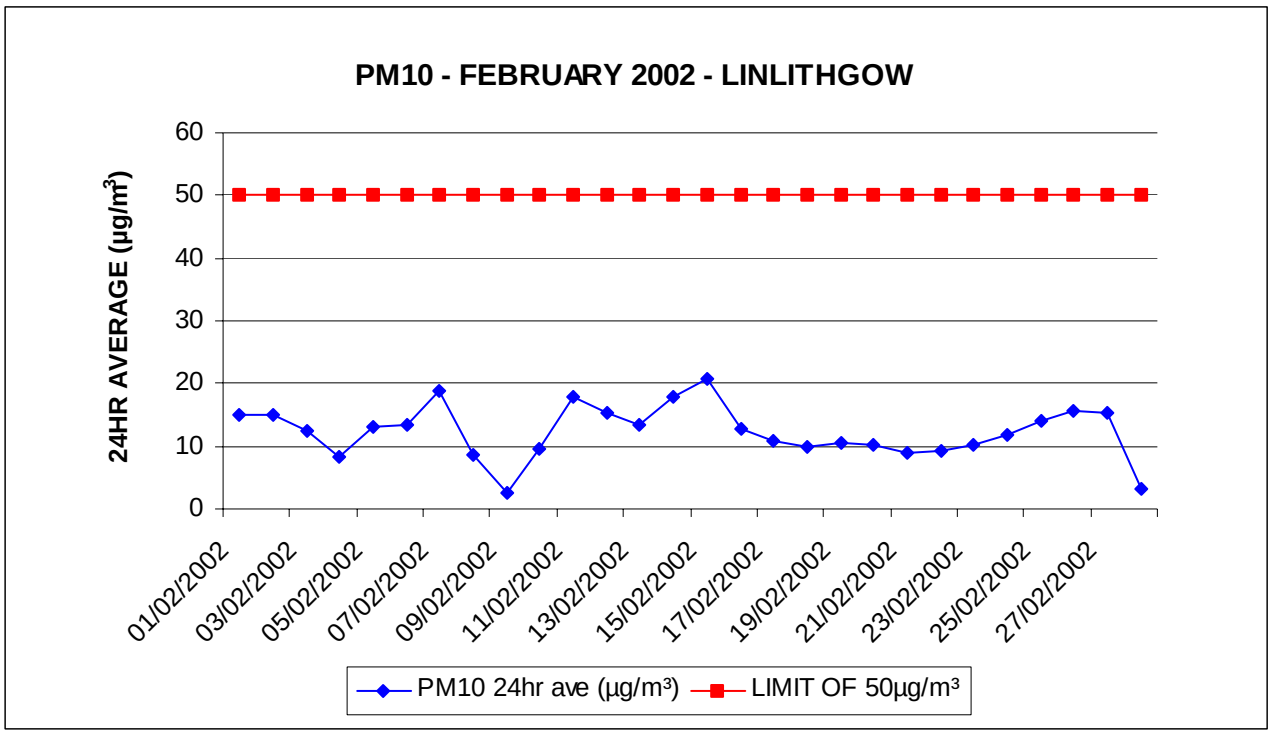


Figure 6.28 – Linlithgow High St – March 2002

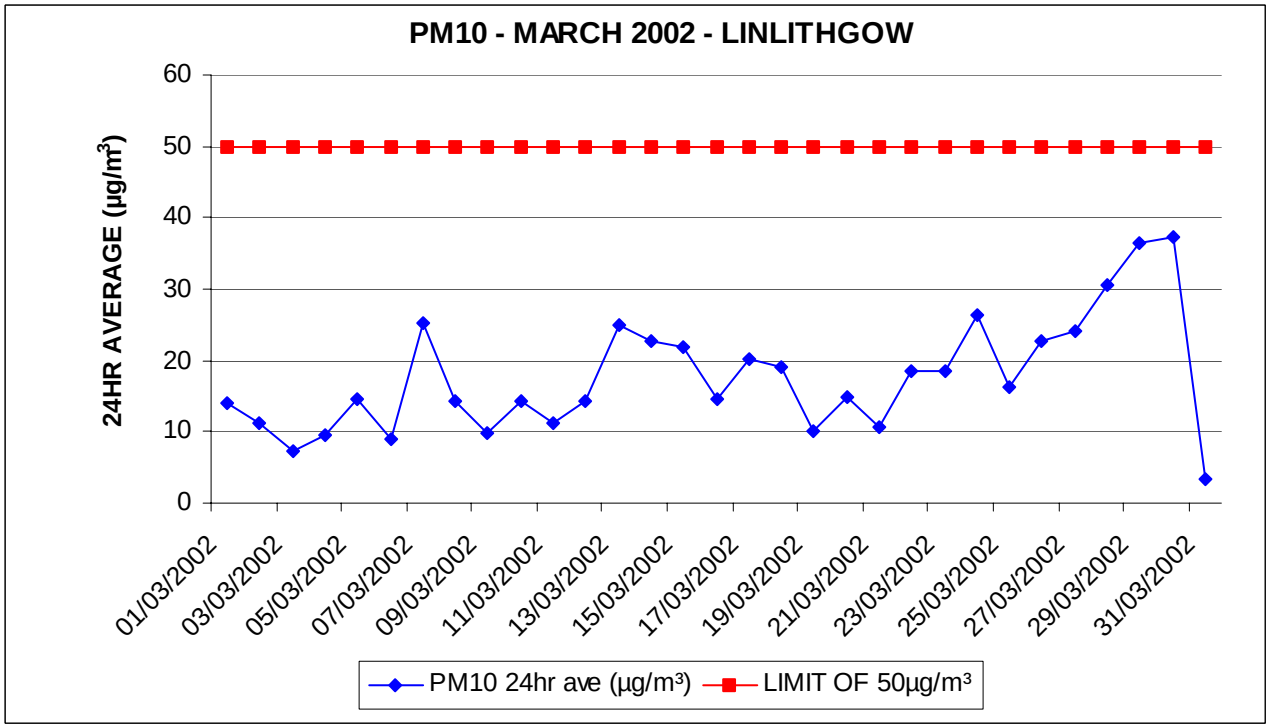


Figure 6.29 – Linlithgow High St – April 2002

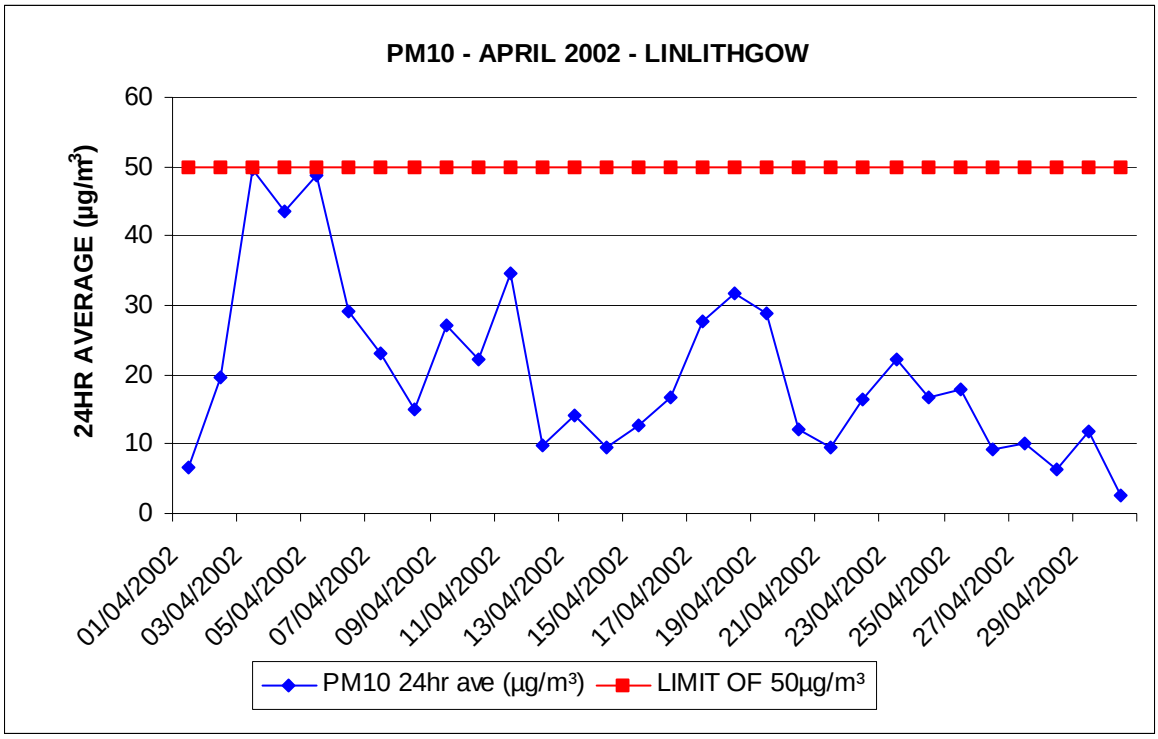


Figure 6.30 – Linlithgow High St – May 2002

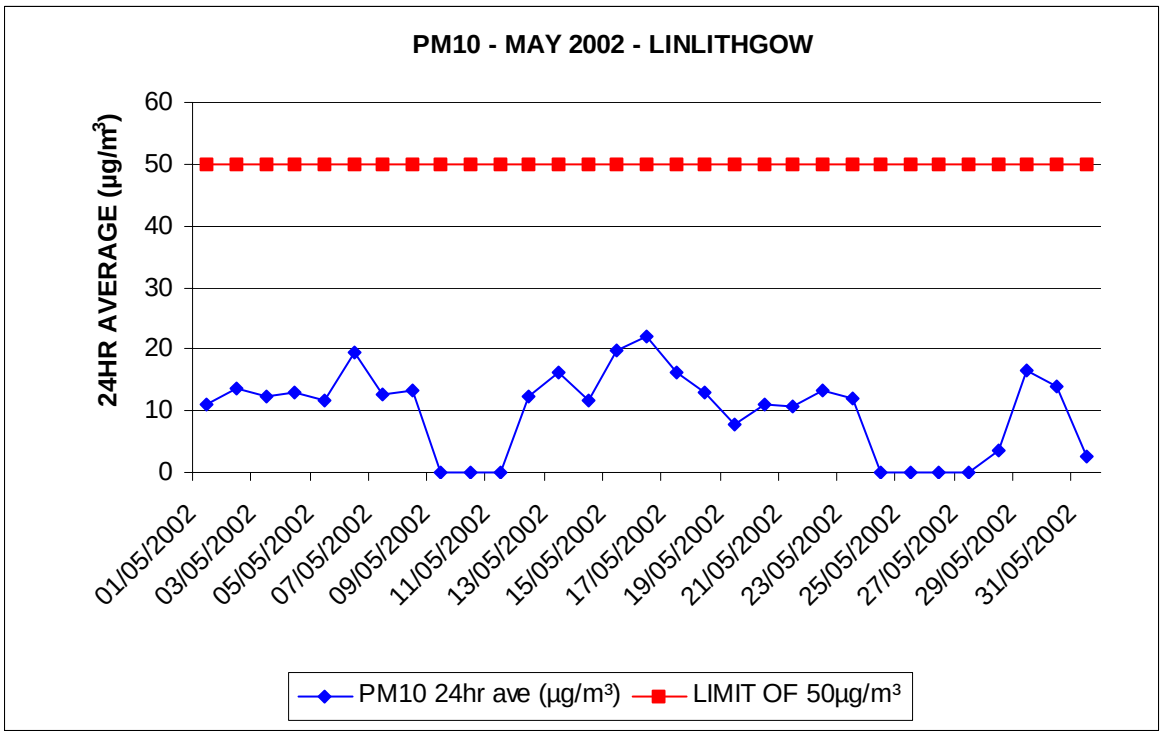
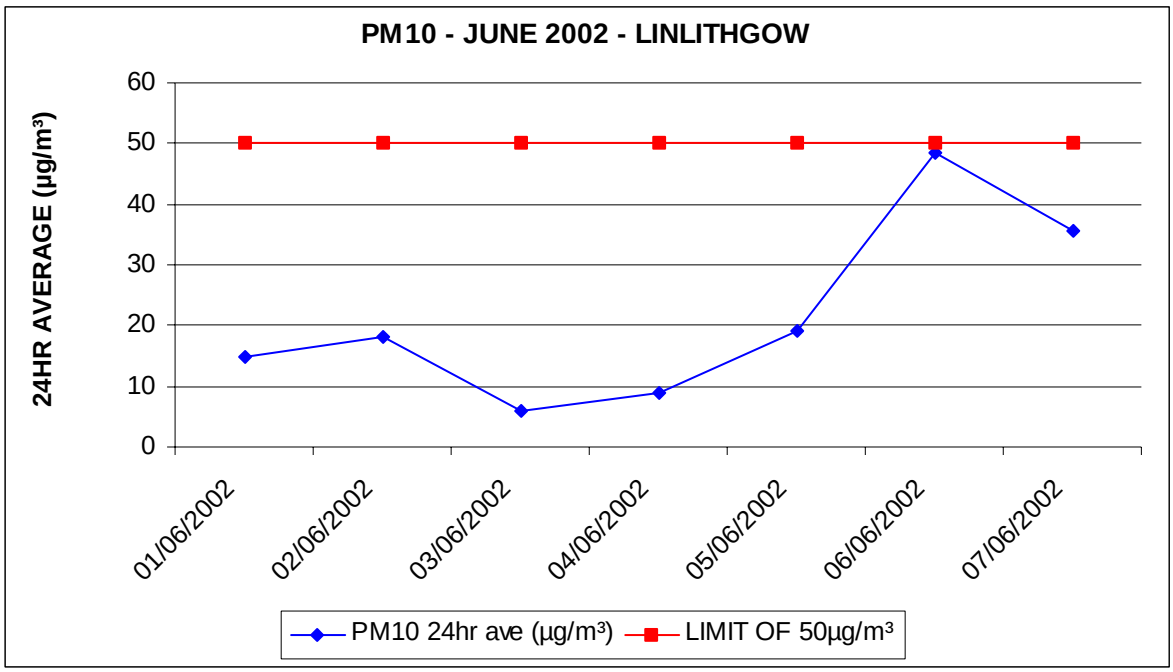


Figure 6.31 – Linlithgow High St – June 2002



PM_{10} – Linlithgow – 05/12/01 to 07/06/02 – Monthly & Annual Average

It can be seen from the graph (fig 6.25) there were four 24-hour exceedences in December 2001 when the Groundhog was located at Linlithgow High St from 04/12/01 to 07/06/02. These exceedences occurred from the 10th December 2001 to 13th December 2001 and were exceedences of 61.9μg/m³, 61.3μg/m³, 59.2μg/m³ and 58.4μg/m³.

After comparing the results for December 2001 at the Groundhog in Linlithgow, similar high readings were shown for Whitehill & Standhill at Riddochill Bing, Blackburn (PM_{10} is measured at these sites using the osiris units). On the 11th December 2001there was a reading of 51μg/m³ at Standhill Cottages and on the 13th December 2001 a reading of 52.3μg/m³ at Whitehill Industrial Estate. This indicates that the 24 hour exceedences of PM_{10} in December at Linlithgow High Street may not have been solely due to traffic and were more likely due to secondary PM_{10} as the two Riddochill sites are approximately 10miles away. On 6th June 2002 at the Groundhog there was a peak of 48.4μg/m³ and a similar peak was displayed on the Osiris unit at Standhill Cottages on the same day with a peak of 59μg/m³. Unfortunately, there was no data available at Whitehill Industrial Estate due to technical problems.

Table 6.4 – Monthly and Annual Average – 5th December 2001 to 7th June 2002

MONTHLY AVERAGE	PM_{10} (μg/m³)
Dec-01	20.1
Jan-02	16.3
Feb-02	12.3
Mar-02	17.7
Apr-02	20.2
May-02	10
Jun-02	21.6
ANNUAL AVERAGE (7 MONTHS)	16.9

Table 6.4 above shows that there was a seven-month average of 16.9μg/m³ at Linlithgow High St for the period 05/12/01 to 07/06/02 and this meets the annual standard of 40μg/m³ to be achieved by 2004.

It was the intention to relocate the Groundhog in Whitburn town centre earlier but again there were considerable delays in power supply provision as the road had to be dug up and a feed from the mains supplied to our own box.

PM_{10} RESULTS – MANSE RD, WHITBURN – JULY 2002 TO APRIL 2003

Figure 6.32 – Manse Rd, Whitburn – July 2002

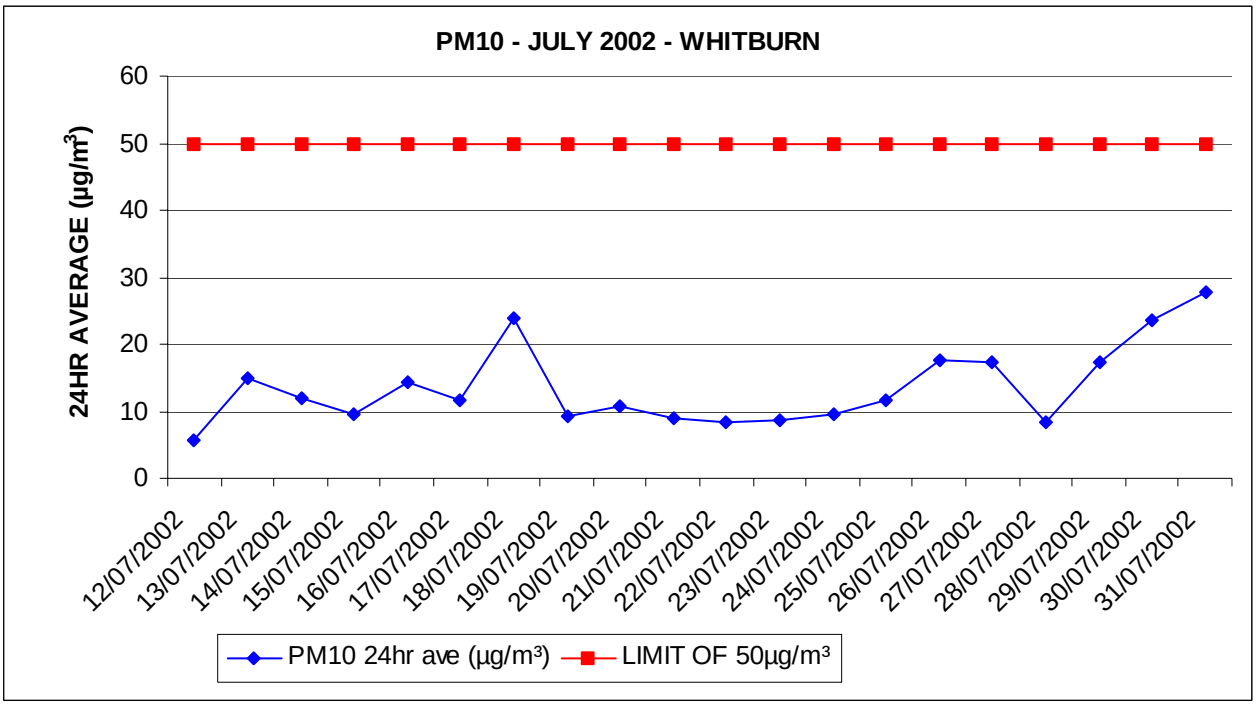


Figure 6.33 – Manse Rd, Whitburn – August 2002

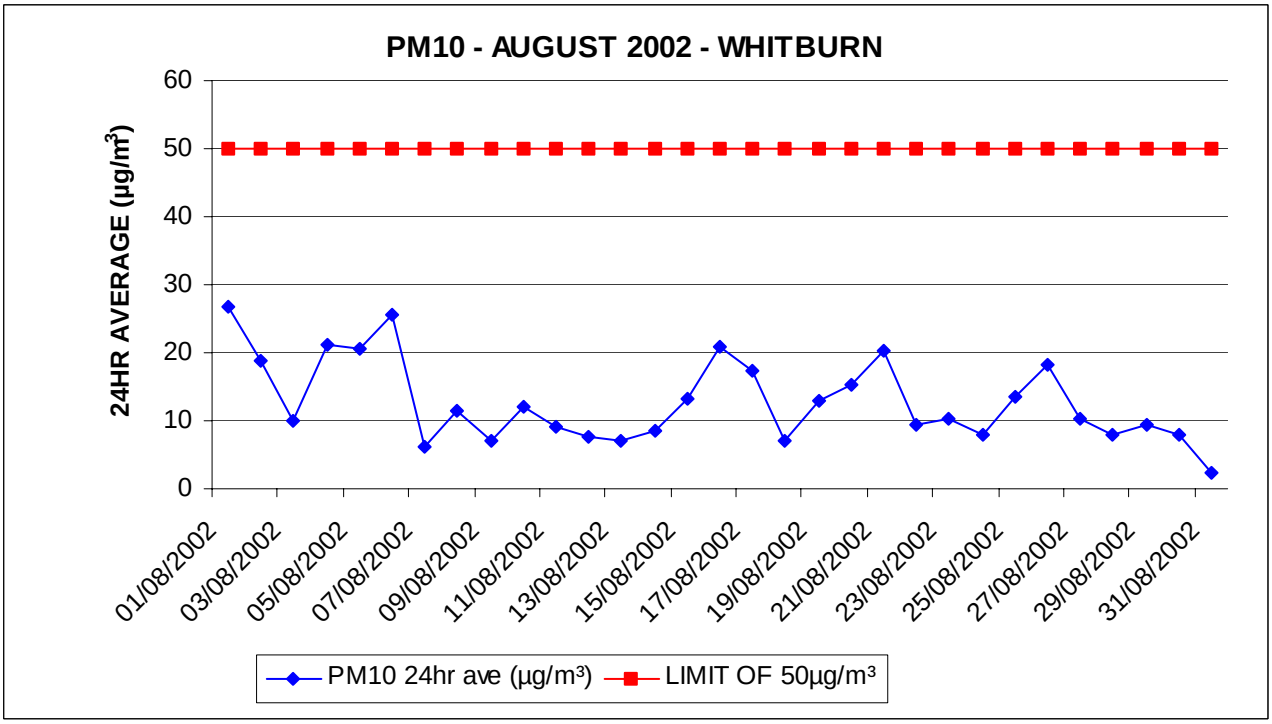


Figure 6.34 – Manse Rd, Whitburn – September 2002

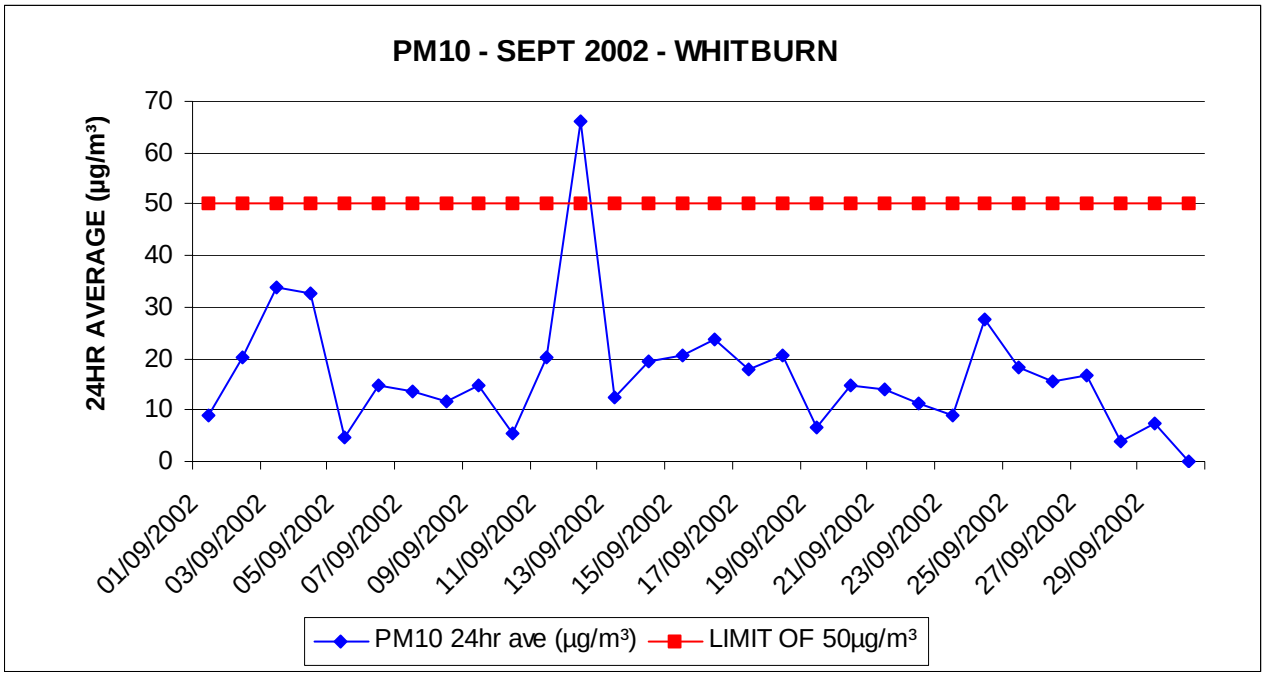


Figure 6.35 – Manse Rd, Whitburn – October 2002

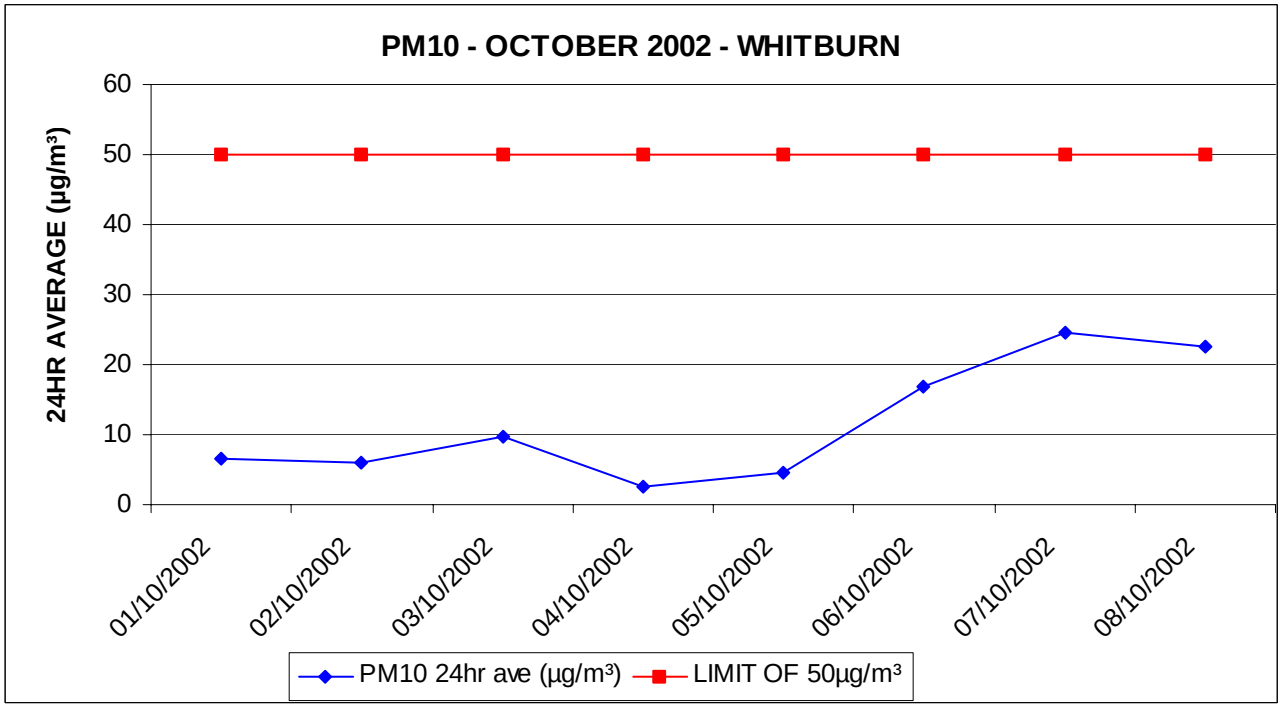


Figure 6.36 – Manse Rd, Whitburn – November 2002

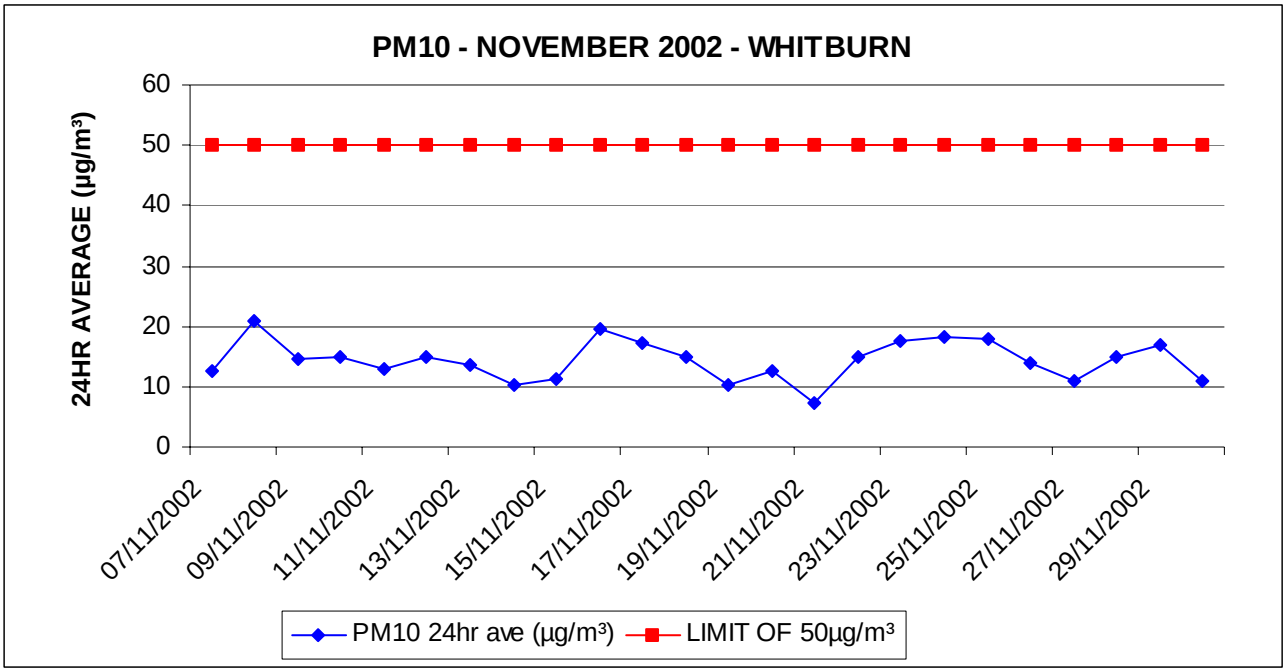


Figure 6.37 – Manse Rd, Whitburn – December 2002

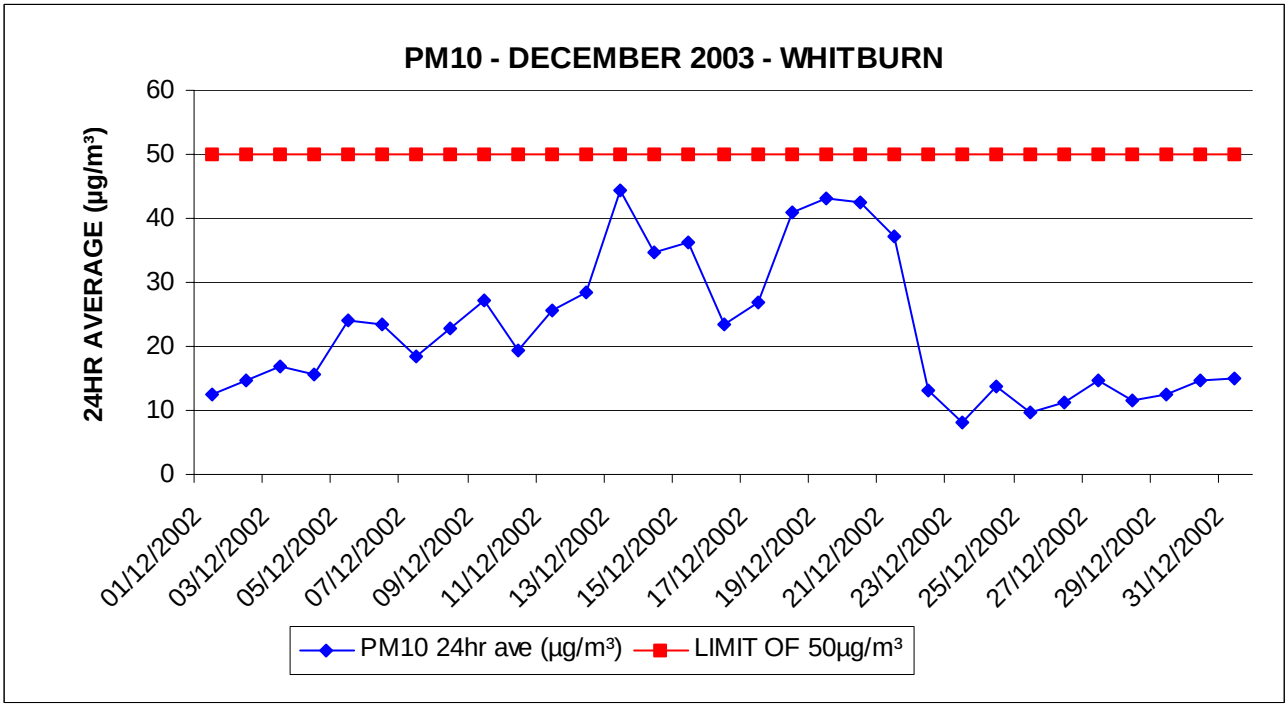


Figure 6.38 – Manse Rd, Whitburn – January 2003

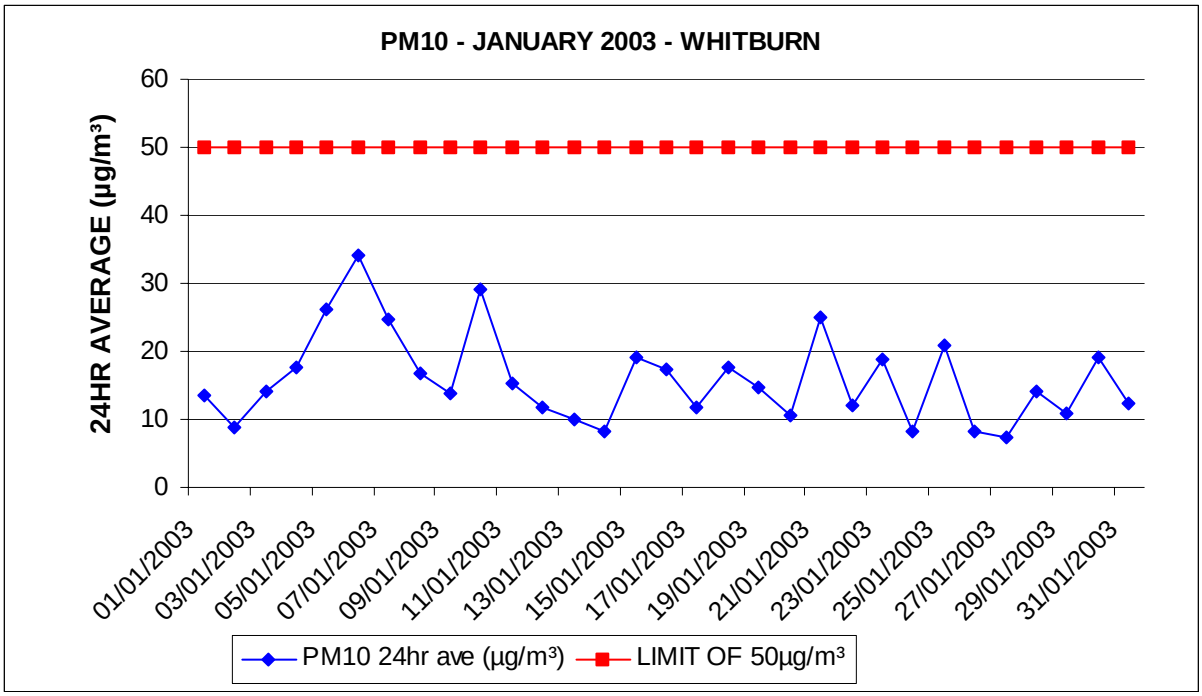


Figure 6.39 – Manse Rd, Whitburn –February 2003

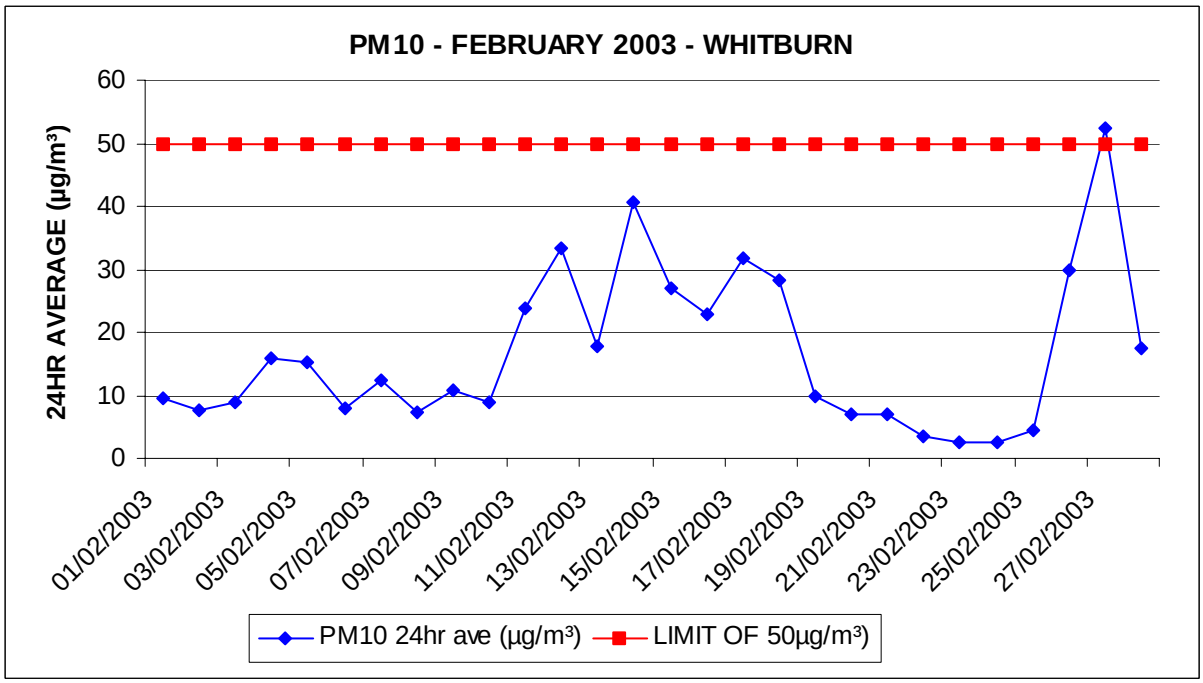


Figure 6.40 – Manse Rd, Whitburn –March 2003

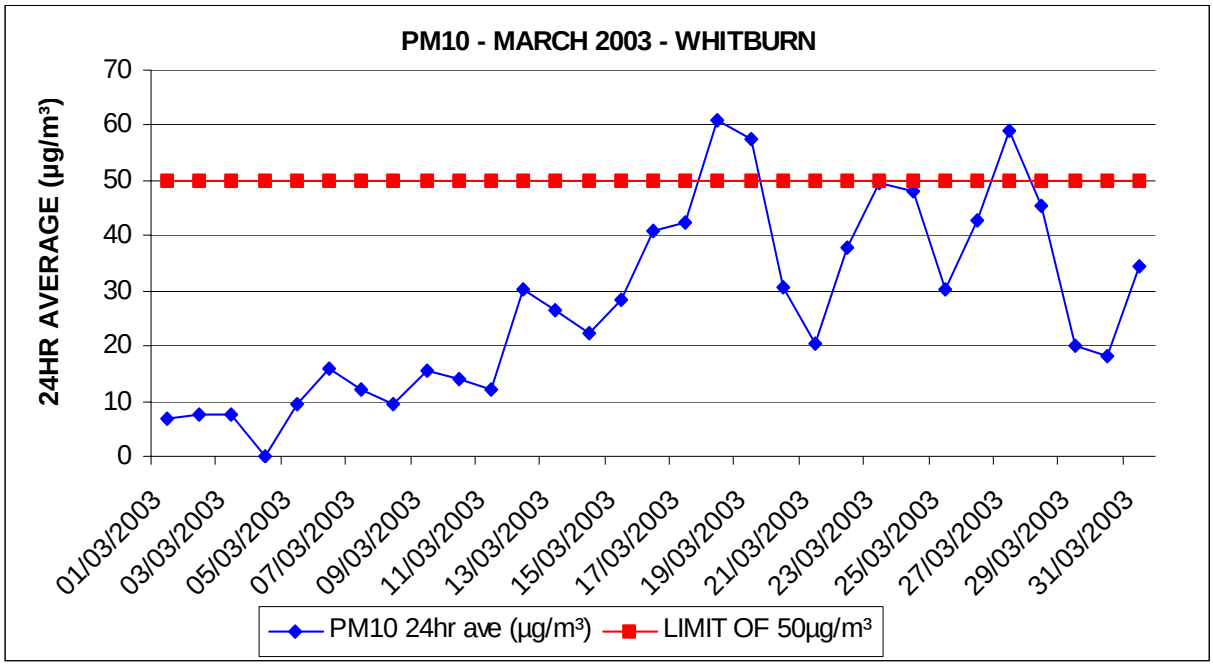
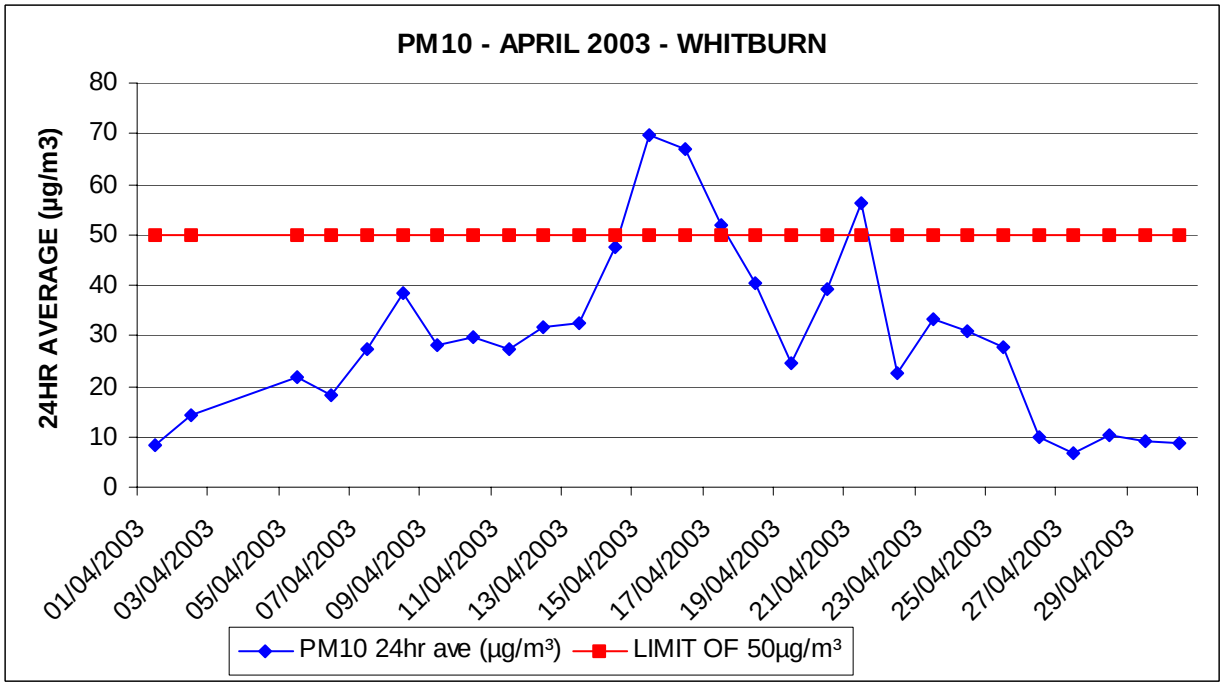


Figure 6.41 – Manse Rd, Whitburn –April 2003



PM_{10} – Whitburn – 12/07/02 to 31/03/03 – Monthly & Annual Average

It can be seen from the graphs (figs 6.34, 6.39, 6.40, & 6.41) there have been nine 24-hour exceedences since the Groundhog was located at Manse Rd, Whitburn. The first exceedence occurred on the 12th of September 2002 and was a reading of 66.2μg/m³. On the 27th of February 2003 there was an exceedence of 52.3μg/m³ and there were three exceedences in March 2003 with readings of 61.1μg/m³, 57.6μg/m³ and 59.2μg/m³ on the 18th, 19th and 27th March 2003. There were also four exceedences in April 2003 with readings of 69.6μg/m³, 66.8μg/m³, 51.9μg/m³ and 56.3μg/m³ on the, 15th, 16th, 17th & 21st April 2003.

However, after comparing these results to our Osiris PM_{10} results, similar readings at the same time of the month were displayed at Standhill Cottages, Whitehill Ind Estate and Polkemmet Primary School, Whitburn (see figs 6.42 – 6.45). This again indicates that the PM_{10} 24hr exceedences displayed at the Groundhog are not due to localised PM_{10} from traffic.
The Osiris units at Riddochill Bing, Blackburn (Standhill & Whitehill) are approximately 3 & 4 miles to the east of the Groundhog in Whitburn. The Polkemmet Primary School site is approximately 1 mile to the south of the Whitburn Groundhog site.

Table 6.5 – Monthly & Annual Average – July 2002 to April 2003

MONTHLY AVERAGE	PM_{10} (μg/m³)
Jul-02	13.5
Aug-02	12.8
Sep-02	16.9
Oct-02	11.7
Nov-02	11.5
Dec-02	22.7
Jan-03	15.9
Feb-03	16.6
Mar-03	27.6
Apr-03	27.8
ANNUAL AVERAGE (10 MONTHS)	17.7

Table 6.5 above shows that there was a ten-month average of 17.7μg/m³ at Manse Rd, Whitburn and this meets the annual standard of 40μg/m³ to be achieved by 2004.

The following Osiris PM_{10} graphs (figs 6.42 – 6.45) have been included in this report to show the similar high readings as displayed at the Groundhog.

Osiris PM_{10} Graphs, Whitehill Ind Est, Standhill Cottages

Figure 6.42 – Standhill Cottages, Osiris PM_{10} data – September 2002

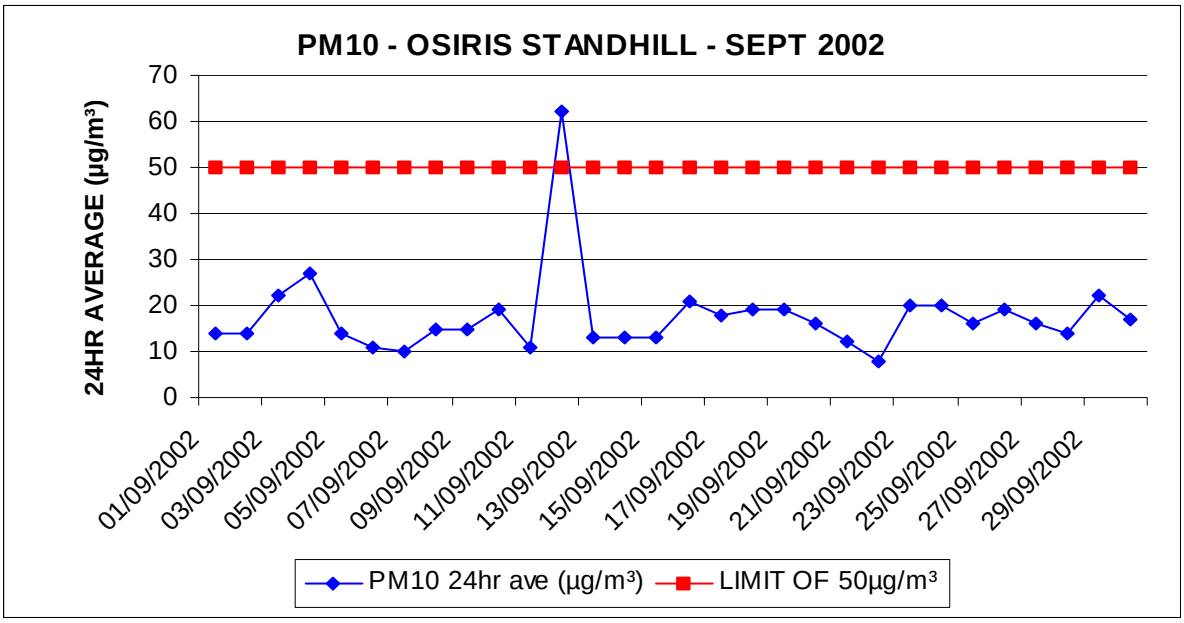


Figure 6.43 – Whitehill Industrial Estate, Osiris PM_{10} data – February 2003

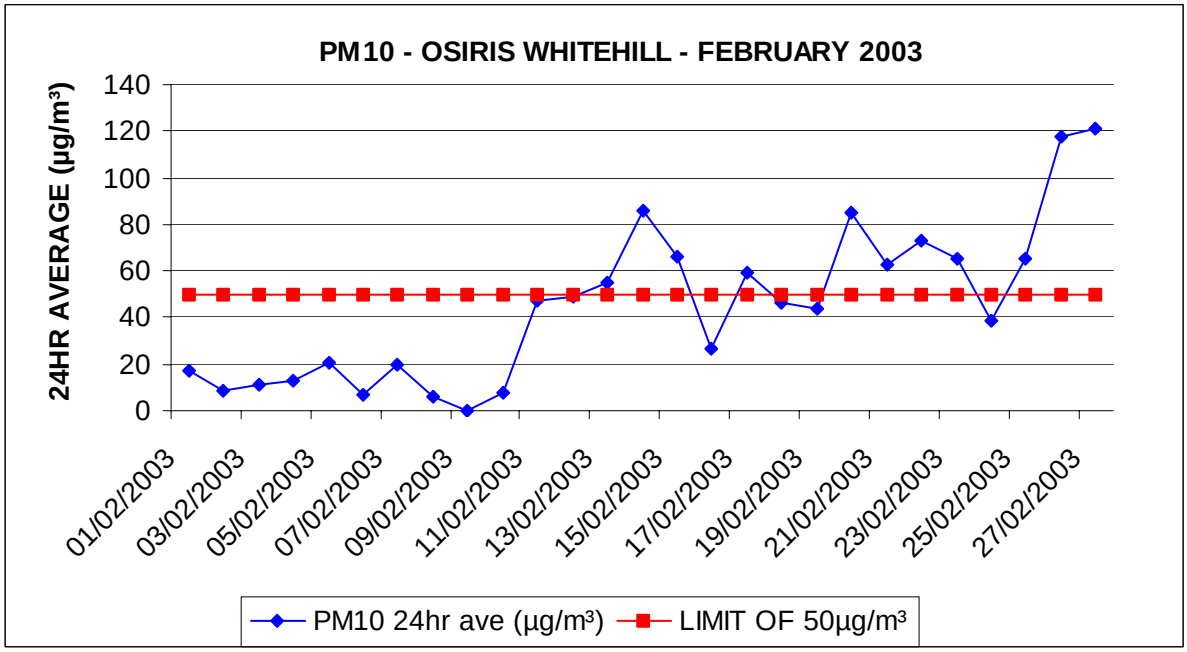


Figure 6.44 – Whitehill Industrial Estate, Osiris PM_{10} data – March 2003

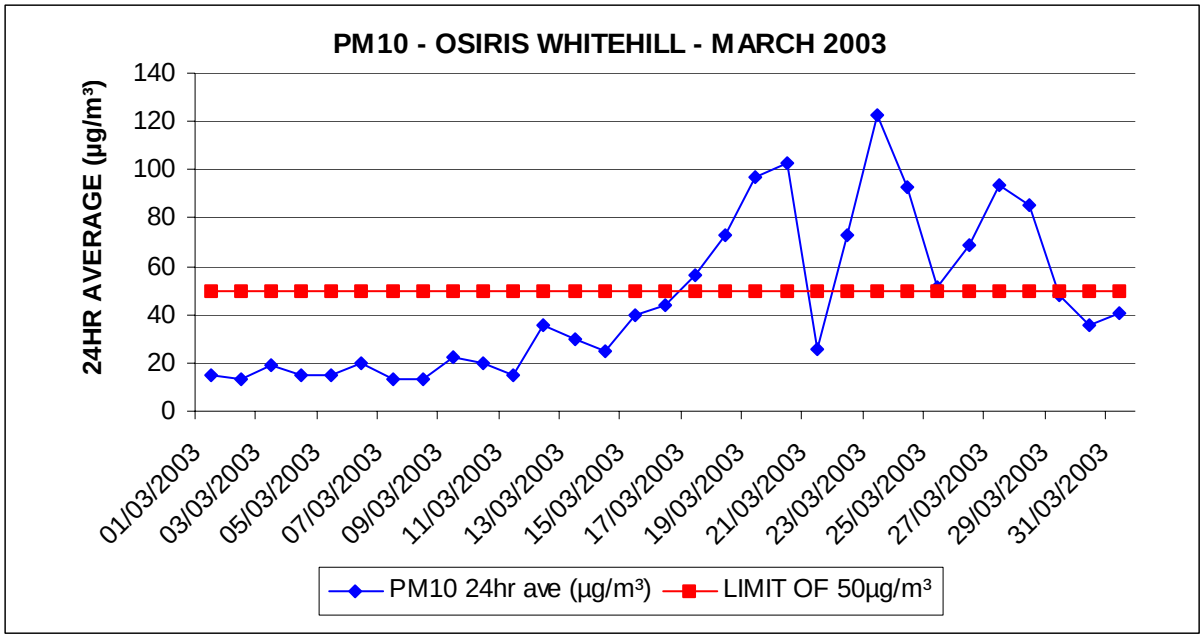
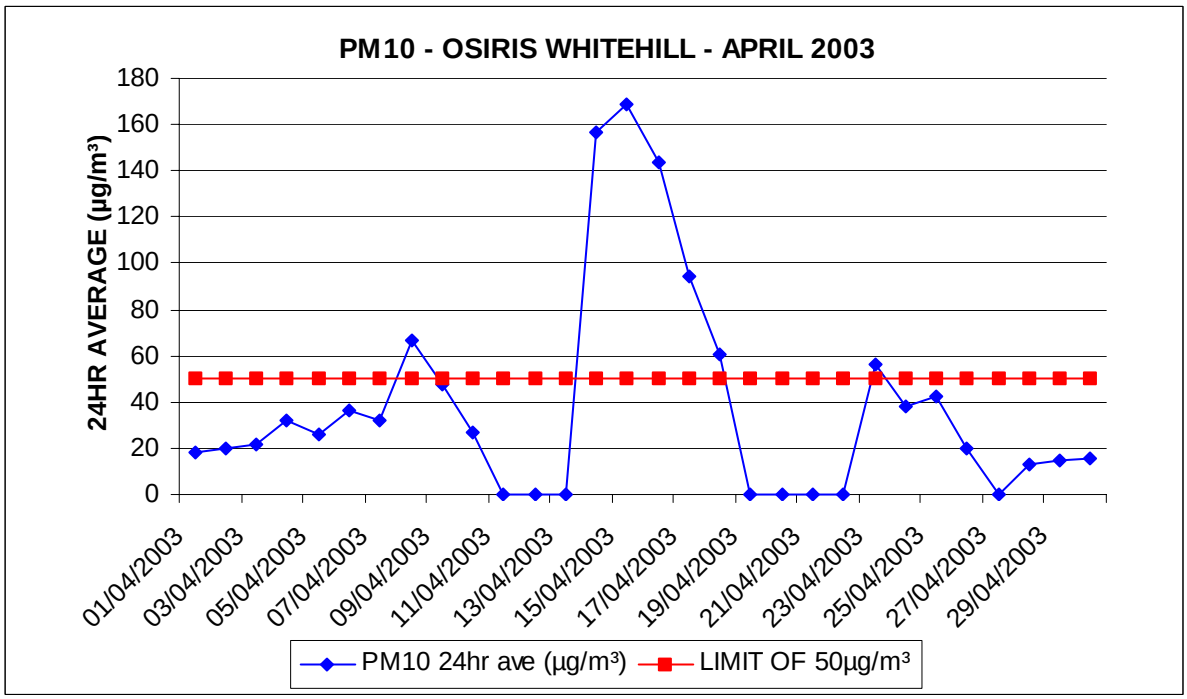


Figure 6.45 – Whitehill Industrial Estate, Osiris PM_{10} data – April 2003



Annual Mean Predictions for 2004 & 2010

Box 8.6: Approach to correcting measured PM_{10} Concentrations to 2004 & 2010 (taken from page 8-10 of technical guidance)

Predictions for 2004 at Linlithgow High St

Calculations using Linlithgow 2000 annual average - see Table 6.1, page 43

Step 1: Adjust the TEOM data to estimate gravimetric values
11.1 x 1.3 = 14.43μg/m³
CG_{2000} = 14.43μg/m³

Step 2: Secondary PM_{10} from internet maps 2001
(**$Csec_{2001}$) = 3.86μg/m³**

Step 3: Estimate local secondary PM_{10} for 2000 ($Csec_{2000}$) using correction factors in Box 8.7, i.e [$Csec_{2000}$ = $Csec_{2001}$ x 0.891]
= 3.86 x 0.891 = **3.44μg/m³**

Step 4: Estimate the local primary PM_{10} in 2000 ($Cprim_{2000}$) by subtracting the 2000 Secondary concentration and the PM_{10} coarse concentration(10.5μg/m³) from The measured concentration, i.e
[$Cprim_{2000}$] = [CG_{2000}] – [$Csec_{2000}$] – 10.5
= 14.43 – 3.44 – 10.5
= **0.49μg/m³**

Step 5: Adjust the local primary PM_{10} from 2000 to 2004 using table correction factors from Box 8.7
[$Cprim_{2004}$] = [$Cprim_{2000}$] x (0.930/1.025)

= **0.445μg/m³**

Step 6: Calculate the secondary PM_{10} in the same future year 2004 using table correction Factors in Box 8.7
[$Csec_{2004}$] = [$Csec_{2001}$] x 0.932
= 3.86 x 0.932
= **3.60μg/m³**

Step 7: Calculate the total estimated PM_{10} in 2004 by adding the components together
[CG2004] = [Cprim2004] + [Csec2004] + 10.5

= 0.445 + 3.60 + 10.5 = **14.5μg/m³**

The predicted 2004 annual mean PM_{10} concentration at Linlithgow High St based on 12 months real-time monitoring data in the year 2000 is **14.5μg/m³.**

Predictions for 2010 at Linlithgow High St

Calculations using Linlithgow 2000 annual average – See Table 6.1, page 43

Step 1: 11.1 x 1.3 = **14.43** [CG_{2000}]

Step 2: [$Csec_{2001}$] = **3.86**

Step 3: [$Csec_{2000}$] = 3.86 x 0.891 = **3.44**

Step 4: [$Cprim_{2000}$] = [CG2000] – [Csec2000] –10.5
= 14.43 – 3.44 – 10.5
= 0.49

Step 5: [$Cprim_{2010}$] = [$Cprim_{2000}$] x 0.815/1.025
= 0.49 x 0.815/1.025
= **0.39**

Step 6: [$Csec_{2000}$] = [$Csec_{2001}$] x 0.795
= 3.86 x 0.795
= **3.07**
Step 7: [CG2010] = [Cprim2010] + [Csec2000] + 10.5
= 0.39 + 3.07 + 10.5
= **13.96μg/m³**

The predicted 2010 annual mean PM_{10} concentration at Linlithgow High St based on 12 months real-time monitoring data in the year 2000 is **13.96μg/m³.**

Predictions for 2004 at Linlithgow High St

Calculations using Linlithgow January 2001 to May 2001 annual average
See Table 6.2, page 46

Step 1: 13.6 x 1.3 = **17.7μg/m³**

Step 2: [Csec2001] = **3.86**

Step 3: 3.86 x 1.000 = **3.86**

Step 4: [Cprim2001] = [CG2001] – [Csec2001] – 10.5

= 17.7 – 3.86 – 10.5

= **3.34**

Step 5: [Cprim2004] = [Cprim2001] x 0.930/1.000

= 3.34 x 0.930

= **3.11**

Step 6: [Csec2004] = [Csec2001] x 0.932

= 3.86 x 0.932

= **3.60**

Step 7: [CG2004] = [Cprim2004] + [Csec2004] + 10.5

= 3.11 + 3.60 + 10.5

= **17.2μg/m³**

The predicted 2004 annual mean PM_{10} concentration at Linlithgow High St based on five months real-time monitoring data from January 2001 to May 2001 is **17.2μg/m³**.

Predictions for 2010 at Linlithgow High St

Calculations using annual average from January 2001 to May 2001
See Table 6.2, page 46

Step 1: 13.6 X 1.3 = **17.7μg/m³**

Step 2: [Csec2001] = **3.86μg/m³**

Step 3: [Csec2002] = [Csec2001] x 0.977

= 3.86 x 0.977

= **3.77**

Step 4: Cprim2002 = 17.7 – [Csec2002] – 10.5

= 17.7 – 3.77 – 10.5

= **3.43**

Step 5: Cprim2010 = [Cprim2002] x 0.815/0.977

= 3.43 x 0.834

= **2.86**

Step 6: Csec2002 x 0.795/0.977

= 3.77 x 0.81

= **3.05**

Step 7: CG2010 = [Cprim2010] + [Csec2010] + 10.5

= 2.86 + 3.05 + 10.5

= 16.4μg/m³

The predicted 2010 annual mean PM_{10} concentration at Linlithgow High St based on five months real-time monitoring data from January 2001 to May 2001 is **16.4μg/m³**.

Predictions for 2004 at Linlithgow High St

Calculations using annual average from December 2001 to June 2002
See Table 6.4, page 56
Step 1: 13 x 1.3 = **16.9μg/m³**

Step 2: [Csec2001] = **3.86μg/m³**

Step 3: [Csec2002] = 3.86 x 0.977 = **3.77**

Step 4: [Cprim2002] = [CG2002] – [Csec2002] – 10.5

= 16.9 – 3.77 – 10.5

= **2.63**

Step 5: [Cprim2004] = [Cprim2002] x 0.930/0.977

= 2.63 x 0.95

= **2.50**

Step 6: [Csec2004] = [Csec2002*] x 0.932*

= 3.77 x 0.932

= **3.51**

Step 7: [CG2004] = [Cprim2004] + [Csec2004] + 10.5

= 2.50 + 3.51 + 10.5

= **16.51μg/m³**

The predicted 2004 annual mean PM_{10} concentration at Linlithgow High St based on seven months real-time monitoring data from December 2001 to June 2002 is **16.51μg/m³**.

Predictions for 2010 at Linlithgow High St

Calculations using annual average from December 2001 to June 2002
See Table 6.4, page 56
Step 1: 13 x 1.3 = **16.9μg/m³**

Step 2: [Csec2001] = **3.86**

Step 3: [Csec2002] = [Csec2001] x 0.977

= **3.77**

Step 4: [Cprim2002] = 16.9 – [Csec2002] – 10.5

= 16.9 - 3.77 – 10.5

= **3.43**

Step 5: [Cprim2010] = [Cprim2002] x 0.815/0.977

= 3.43 x 0.834

= **2.86**

Step 6: [Csec 2010] = [Csec2002] x 0.795/0.977

= 3.77 x 0.81

= **3.05**

Step 7: [CG2010] = [Cprim2010] = [Csec2010] + 10.5

= 2.86 + 3.05 + 10.5

= **16.41μg/m³**

The predicted 2010 annual mean PM_{10} concentration at Linlithgow High St based on seven months real-time monitoring data from December 2001 to June 2002 is **16.41μg/m³**.

Predictions for 2004 at The Steelyard, Bathgate

Calculations using Bathgate 2001 annual average
See Table 6.3, page 51

Step 1: 12 x 1.3 = **15.6μg/m³** [CG2001]

Step 2: [Csec2001] = **3.86μg/m³**

Step 3: [Csec2001] = [Csec2001] x 1.000
= **3.86μg/m³**

Step 4: Cprim2001 = [CG2001] – [Csec2001] - 10.5

= [15.6 – 3.86] – 10.5

= **1.24**

Step 5: Cprim2004 = [Cprim2001] x 0.930/1.000

= **1.15**

Step 6: Csec2004 = [Csec2001] x 0.932

= 3.86 x 0.932
= **3.6μg/m³**

Step 7: CG2004 = [Cprim2004] + [Csec2004] + 10.5

= 1.15 + 3.6 + 10.5

= **15.25μg/m³**

The predicted 2004 annual mean PM_{10} concentration at The Steelyard, Bathgate is based on seven months real-time monitoring data from May 2001 to November 2001 is **15.25µg/m³**.

Predictions for 2010 at The Steelyard, Bathgate

Calculations using Bathgate 2001 annual average
See Table 6.3, page 51
Step 1: 12 x 1.3 = **15.6µg/m³** [CG2001]

Step 2: [Csec2001] = **3.86µg/m³**

Step 3: [Csec2001] = [Csec2001] x 1.000
= **3.86µg/m³**

Step 4: $Cprim_{2001}$ = [CG2001] – [Csec2001] - 10.5

= [15.6 – 3.86] – 10.5

= **1.24**
Step 5: Cprim2010 = [Cprim2001] x 0.815/1.000

= 1.24 x 0.815

= **1.01**

Step 6: Csec2010 **=** [Csec2001] x 0.795
= 3.86 x 0.795

= **3.07µg/m³**

Step 7:CG2010 = [Cprim2010] + [Csec2010] + 10.5

= 1.01 + 3.07 + 10.5

= **14.58µg/m³ (2010 Prediction for Bathgate)**

The predicted 2010 annual mean PM_{10} concentration at The Steelyard, Bathgate is based on seven months real-time monitoring data from May 2001 to November 2001 is 14.58µg/m³.

Predictions for 2004 at Manse Rd, Whitburn

Calculations using Whitburn July 2002 to April 2003 annual average
See Table 6.5, page 62
Step 1: 13.6 x 1.3 = **17.7µg/m³**

Step 2: [Csec2001] = **3.86µg/m³**

Step 3: [Csec2002] = [Csec2001] x 0.977
= **3.77**

Step 4: Cprim2002 = [CG2002] – [Csec2002] – 10.5
= 17.7 – 3.77 – 10.5

= **3.43**

Step 5: Cprim2004 = [Cprim2002] x 0.930/0.977

= 3.43 x 0.95

= **3.26**

Step 6: Csec2004 = [Csec2002] x 0.932

= 3.77 x 0.932

= **3.5**

Step 7: CG2004 = [Cprim2002] + [Csec2004] + 10.5

= 3.26 + 3.5 + 10.5

= **17.26μg/m³**

The predicted 20004 annual mean PM_{10} concentration at Manse Rd, Whitburn is based on ten months real-time monitoring data from July 2002 to April 2003 is **17.26μg/m³**.

Predictions for 2010 at Manse Rd, Whitburn

Calculations using Whitburn July 2002 to April 2003 annual average
See Table 6.5, page 62
Step 1: 13.6 X 1.3 = **17.7μg/m³**

Step 2: [Csec2001] = **3.86μg/m³**

Step 3: [Csec2002] = [Csec2001] x 0.977

= 3.86 x 0.977

= **3.77**

Step 4: Cprim2002 = 17.7 – [Csec2002] – 10.5

= 17.7 – 3.77 – 10.5

= **3.43**

Step 5: Cprim2010 = [Cprim2002] x 0.815/0.977

= 3.43 x 0.834

= **2.86**

Step 6: Csec2002 x 0.795/0.977

= 3.77 x 0.81

= **3.05**

Step 7: CG2010 = [Cprim2010] + [Csec2010] + 10.5

= 2.86 + 3.05 + 10.5

= **16.4μg/m³**

The predicted 2010 annual mean PM_{10} concentration at Manse Rd, Whitburn is based on ten months real-time monitoring data from July 2002 to April 2003 is **16.4μg/m³**.

Question From Technical Guidance

Estimate the number of 24hr exceedences for 2004
Calculation taken from figure 8.1, page 8-41 of technical guidance

1. Prediction using 2000 Data (Linlithgow)
   Annual mean = **14.43**μg/m³

Y = -18.5 + 0.00145 x annual mean³ + 206/annual mean
= -18.5 +0.00145 x 3005 + 206/14.43
= -18.5 + [4.36] + [14.28]
= **0.14**

2. Prediction using Jan 2001 to May 2001 Data (Linlithgow**)**
   Annual mean **= 17.7**μg/m³

Y = -18.5 + 0.00145 x annual mean³ + 206/annual mean
= -18.5 + 0.00145 x 5545 + 206/17.7
= -18.5 + [8.04] + [11.63]
= **1.2**

3. Prediction using May 2001 to November 2001 Data (Bathgate)
   Annual mean = **15.6**μg/m³

Y = - 18.5 + 0.00145 x annual mean³ + 206/annual mean
= -18.5 + 0.00145 x 3769 + 206/15.6
= -18.5 + [5.50] + [13.20]
= **0.5**

4. Prediction using December 2001 to June 2002 Data (Linlithgow)
   Annual mean = **16.9**μg/m³

Y = -18.5 + 0.00145 x annual mean³ + 206/annual mean
= -18.5 + 0.00145 x 4823 + 206/16.9
= -18.5 + [6.99] + 12.2
= **0.7**

5. Prediction using July 2002 to April 2003 Data (Whitburn) Annual mean = **17.7**μg/m³

Y = -18.5 + 0.00145 x annual mean³ + 206/annual mean
= -18.5 + 0.00145 x 5545 + 206/17.7
= -18.5 + [8.04] + 11.6
= **1.1**

Questions From Technical Guidance (page 8-23)

Are there more than 35 predicted 24-hour exceedences of 50μg/m³ in 2004?
From the calculations above it can be seen that there are not more than 35 exceedences predicted for 2004.

Are any predicted annual means in 2010 greater than 18μg/m³?
From the calculations above it can be seen that there are no annual means predicted to be greater than 18μg/m³.

There is no need to proceed to a detailed assessment for PM_{10} as the answer to the two questions above is no.

Monitoring data within an AQMA
There are not any AQMA areas in West Lothian.

Busy Roads and Junctions in Scotland

The PM_{10} data used above is from the real-time analyser which, is located at three busy town centre locations and is the worst case scenario for measuring for PM_{10}.

Determine whether there is relevant exposure within 10m of the kerb
There is no relevant exposure within 10m of the kerb.

Use the DMRB screening model to predict the annual mean in 2010 at relevant locations.
It was noted that the background PM_{10} values in the maps are too high to use the DMRB model. Therefore, the annual mean predictions for 2010 were calculated using the data from our real-time monitoring & the calculation from page 8-10 of the technical guidance was used.

Use the DMRB screening model to predict the number of 24-hour exceedences of 50μg/m³
The predictions for the number of 24-hour exceedences of 50μg/m³ were calculated using the calculation taken from page 8-41 of the technical guidance and the data from our real-time monitoring was used.

Are there more than 35, 24-hour exceedences of 50μg/m³ predicted in 2004?
No, there were not more than 35 exceedences predicted for 2004.

Roads with high flow of buses and/or HGVs

This is not applicable to West Lothian Council as the figures available show that they are all below 10%.

Are there more than 35 24-hour exceedences of 50μg/m³ predicted in 2004
No we have not predicted more than 35 24-hour exceedences at these locations.

Are any of the predicted annual mean PM_{10} concentrations in 2010 greater than 18μg/m³?
No, none of the predicted annual mean concentrations in 2010 are greater than 18μg/m³.

There is no need to proceed to a detailed assessment for PM_{10} at these locations.

New roads constructed or proposed since last round of Review and Assessment

No new roads have been constructed or proposed since 1st & 2nd stage review & assessment.

Roads close to the objective during the first round of Review and Assessment

There are no roads where more than 30 24-hour exceedences of 50µg/m³ were predicted at relevant locations in 2004.

Roads with significantly changed traffic flows

There are no roads with more than 10,000 vehicles per day that have had large increases in traffic.

NEW INDUSTRIAL SOURCES

As notified by SEPA there are no new industrial sources in West Lothian.

INDUSTRIAL SOURCES WITH SUBSTANTIALLY INCREASED EMISSIONS

As notified by SEPA there are no industrial sources with substantially increased PM_{10} emissions.

AREAS OF DOMESTIC SOLID FUEL BURNING

This was reviewed in the 1st & 2nd stage review & assessment of air quality and there are not any areas of domestic solid fuel burning in West Lothian as most people now have gas central heating.

QUARRIES/LANDFILL SITES/OPENCASTCOAL/HANDLING OF DUSTY CARGOES AT PORTS

There are two sites in West Lothian that are likely to be a source of PM_{10} in the future. The first is the rehabilitation of the Riddochhill bing area to the west of Whitehill Industrial Estate. This site has received planning permission for some opencast operations and the removal of the burning areas of spoil that are currently causing an odour problem.

The second is a much larger operation at the site of the former Polkemmet colliery and involves opencasting, removal of burning spoil areas and major new industrial and housing developments, road links, etc.

It is this Authority's intention through planning conditions to ensure monitoring of PM_{10} at appropriate receptors throughout the phases of the developments.
There are currently three sites monitoring background PM_{10} at these sites prior to the commencement of any works.

AIRCRAFT

This is not applicable to West Lothian Council as there is not an airport located within West Lothian.

CONCLUSION FOR PM_{10}

The three real-time monitoring locations were chosen to represent worst case and are all in busy town centres, with the Bathgate and Whitburn sites located as near as possible to the traffic lights.
Bathgate and Whitburn are the two largest populated towns outwith Livingston in West Lothian. In addition, the Whitburn site is located in a car park just off the traffic lights, making it the worst case example, as cars often sit in the car park with engines running and deliveries to some shops in West Main St are delivered via the car park.

The measured PM_{10} concentrations at all three monitoring locations and the predictions based on the real-time monitoring at these locations indicate that the 2004 & 2010 objectives for PM_{10} can be achieved. Of concern is the fact that where exceedences have occurred in the busy town centres. The other PM_{10} monitoring locations outwith town centres and at background locations have shown similar exceedences. This has been demonstrated with the use of graphs from these background sites at Standhill Cottages, Bathgate, Whitehill Industrial Estate, Blackburn and Polkemmet Primary School, Whitburn. This would suggest that the exceedences in the town centres are not solely attributable to traffic generated PM_{10} pollution but more so secondary PM_{10} from outwith the Council boundaries.
The decision taken some time ago by this authority to invest in real-time monitoring equipment has proved correct as the background PM_{10} figures taken from the maps have given levels roughly equivalent to the measured levels at the roadside sites. This could have resulted in an over prediction of the likely PM_{10} from the DMRB model based on the AADT flows, % HGV's, etc being added to the background level. In some areas this may require an unneccessary detailed assessment where no monitoring is being undertaken.

CHAPTER 7

REVIEW AND ASSESSMENT FOR SULPHUR DIOXIDE

INTRODUCTION

In the U.K the main source of sulphur dioxide is from power stations. Industrial combustion sources are also a significant source of sulphur dioxide. Domestic sources now only contribute to 4% of emissions but in some areas can be a significant source. Road transport contributes to less than 1% of emissions.

Standard and Objective for Sulphur Dioxide

The Air Quality (Scotland) Regulations 2000 and amendment regulations 2002 set the following objectives:-

1-hour mean of 350μg/m³ not to be exceeded more than 24 times a year

24-hour mean of 125μg/m³ not to be exceeded more than 3 times a year

15-minute mean of 266μg/m³ not to be exceeded more than 35 times a year

MONITORING DATA RESULTS: 2000 TO 2003

In West Lothian, sulphur dioxide is monitored using the real-time analyser located in the air quality monitoring unit and has been located at three sites in West Lothian. At present, it is located at Manse Rd, Whitburn. It has previously been located at Linlithgow High St and The Steelyard, Bathgate. There are also two 8-port bubblers located in West Lothian used for measuring daily levels of sulphur dioxide which are part of the U.K Smoke & Sulphur Dioxide Network.
The following graphs show the 15-min mean, 1hr-mean and 24-hr mean for sulphur dioxide for each site the air-quality monitoring unit was located at in West Lothian. But, only the maximum mean value for each month, for each objective has been displayed on the graphs to show the number of exceedences against the standard.

LINLITHGOW HIGH ST - 2000 GRAPHS

Figure 7.1 – Linlithgow High St – Year 2000 - 15min mean monthly max

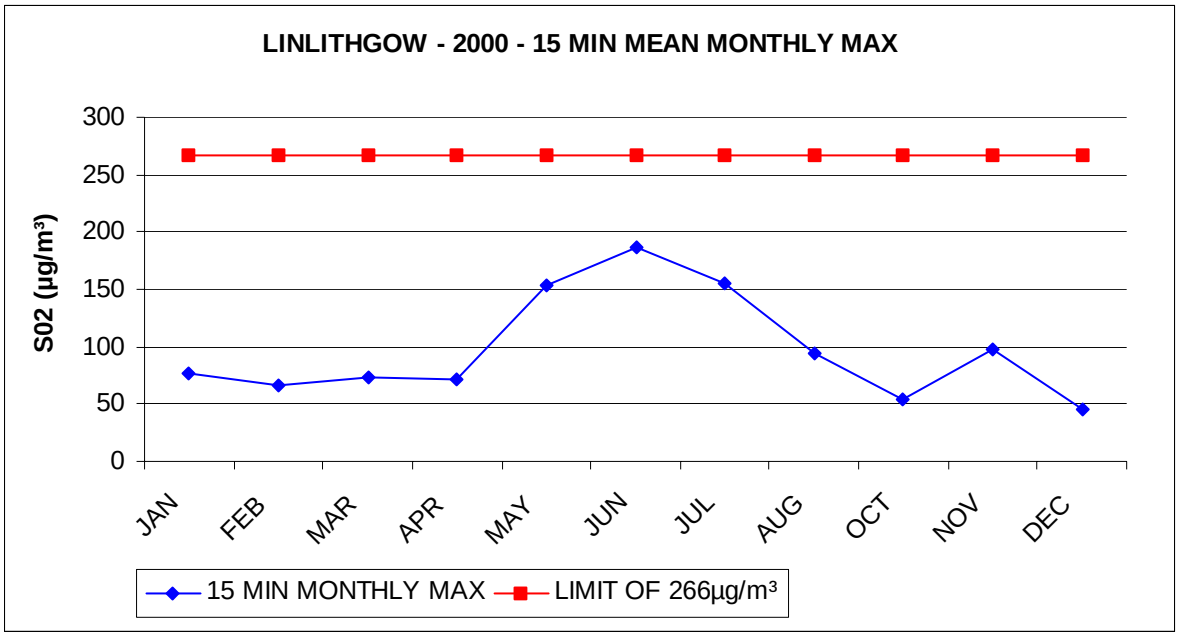


Figure 7.2 – Linlithgow High St – Year 2000 - 1hr mean monthly max

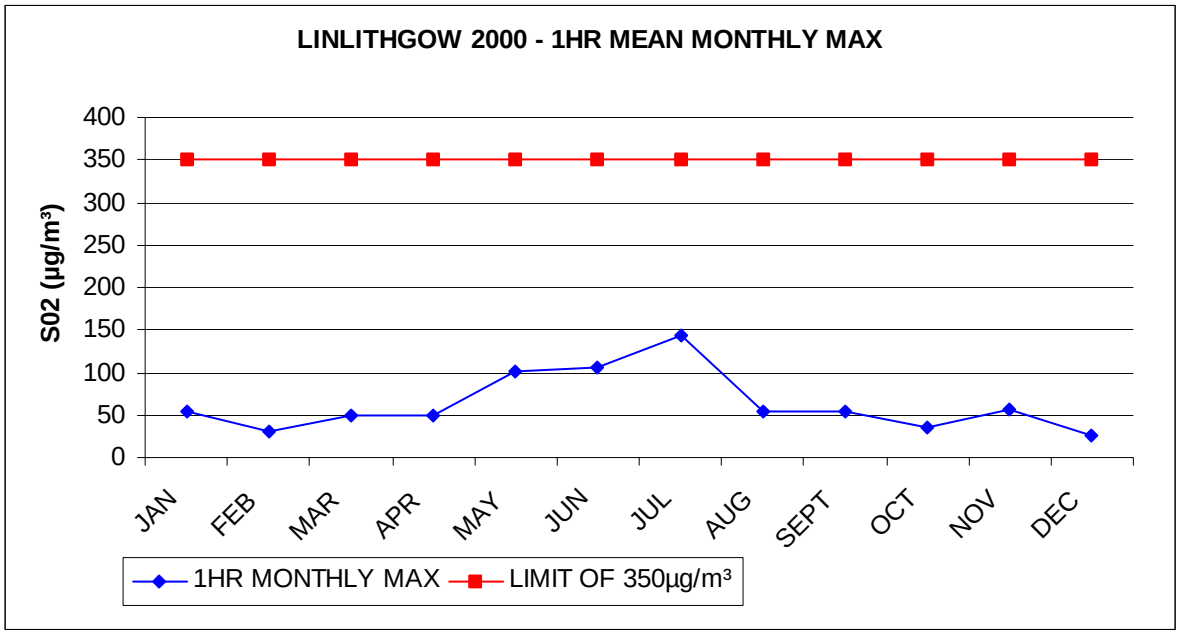
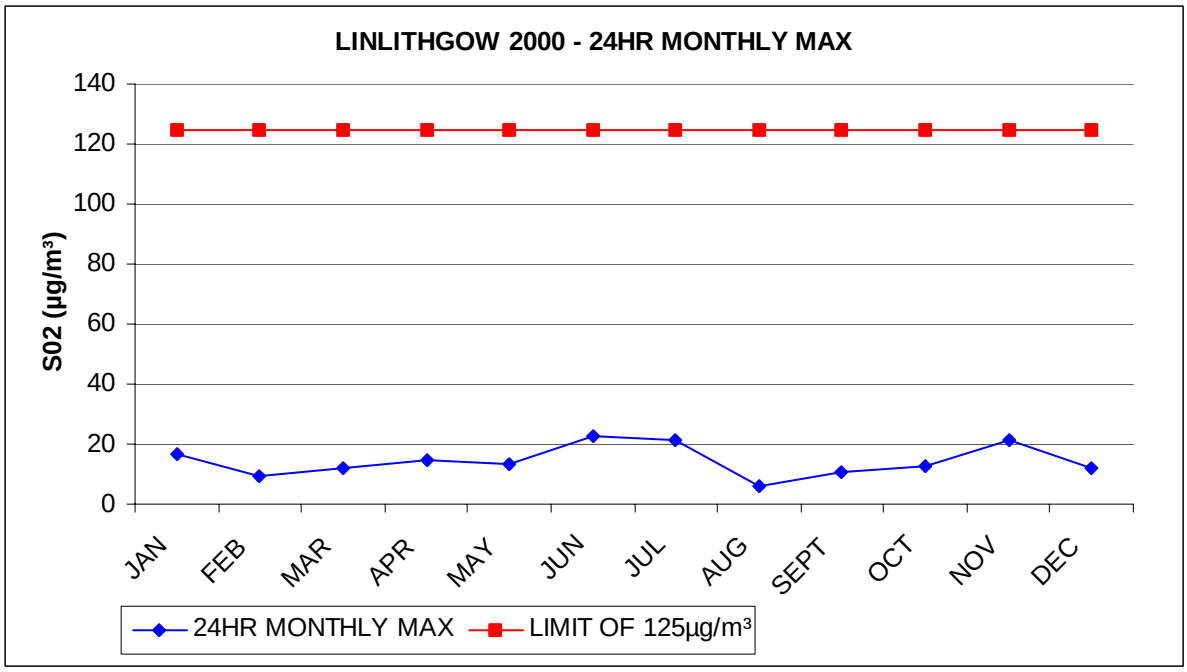


Figure 7.3 – Linlithgow High St – Year 2000 - 24hr mean monthly max



It can be seen from the graphs (figs 7.1 to 7.3) that when the Groundhog (air quality monitoring unit) was located at Linlithgow High St in 2000, there were no exceedences for any of the three objectives for sulphur dioxide.

Figure 7.4 – Linlithgow High St – 01/01/01 to 11/05/01 - 15min mean monthly max

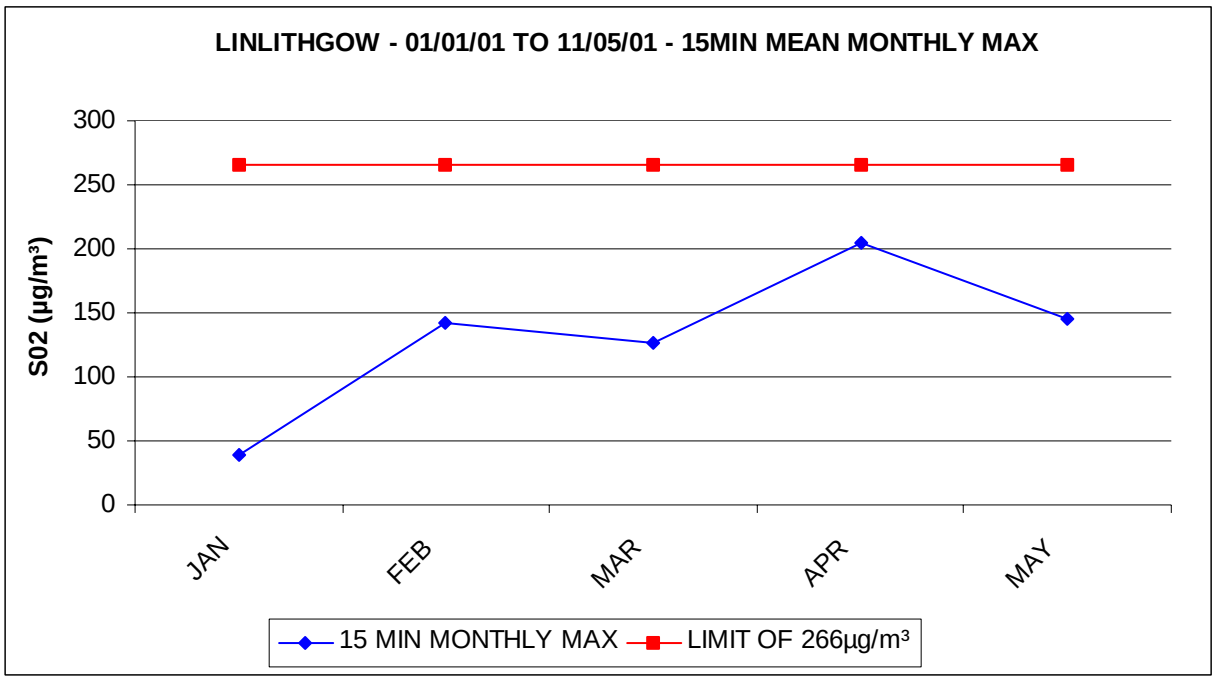


Figure 7.5 – Linlithgow High St – 01/01/01 to 11/05/01 - 1hr mean monthly max

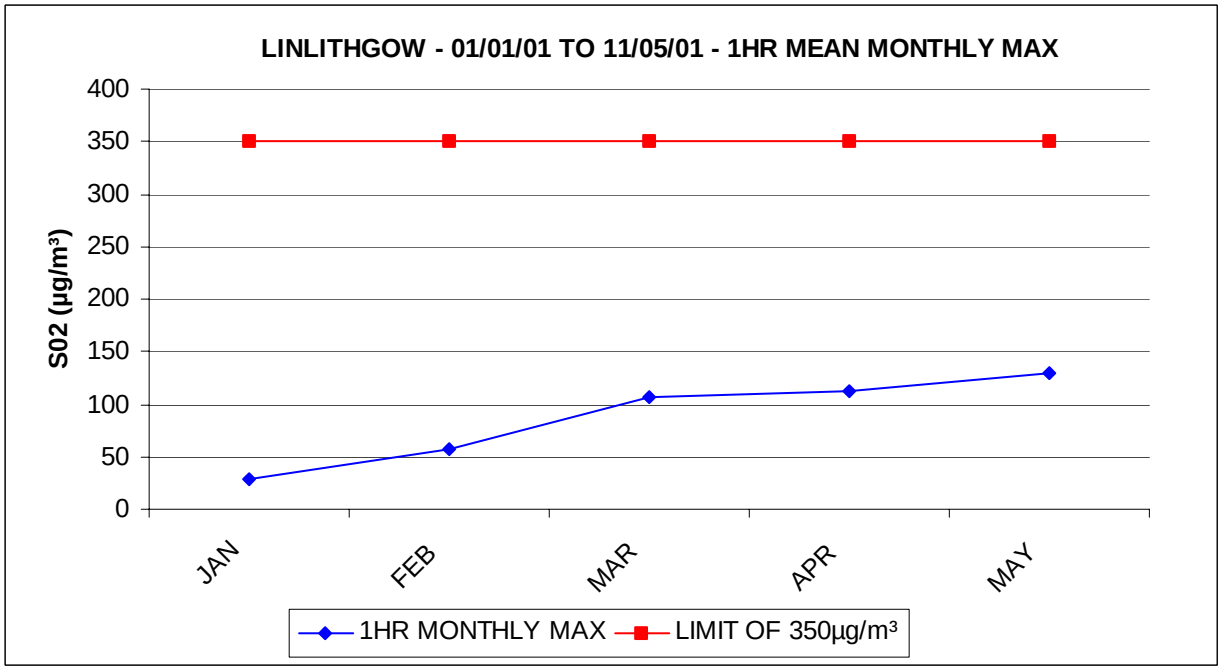
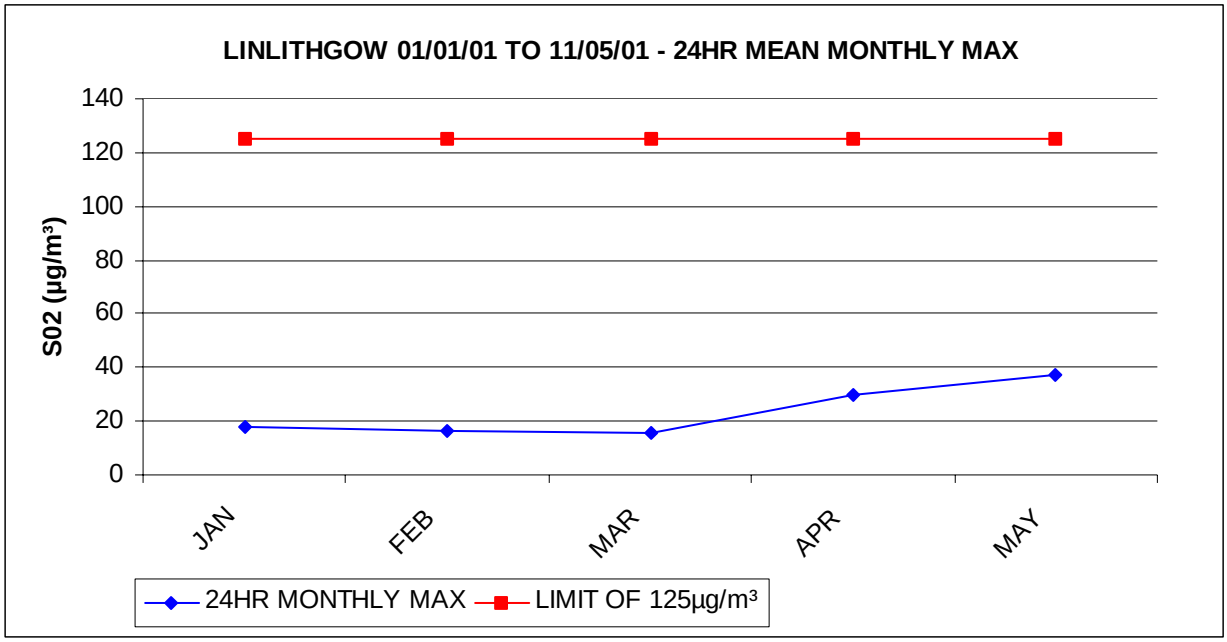


Figure 7.6 – Linlithgow High St – 01/01/01 to 11/05/01 - 24hr mean monthly max



It can be seen from the graphs (figs 7.4 to 7.6) that from 1st January 2001 to 11th May 2001 when the Groundhog was still located at Linlithgow High St, there were no exceedences for any of the three objectives.

THE STEELYARD, BATHGATE – 18/05/01 TO 30/11/01

Figure 7.7 – The Steelyard, Bathgate – 18/05/01 to 30/11/01 - 15min mean monthly max

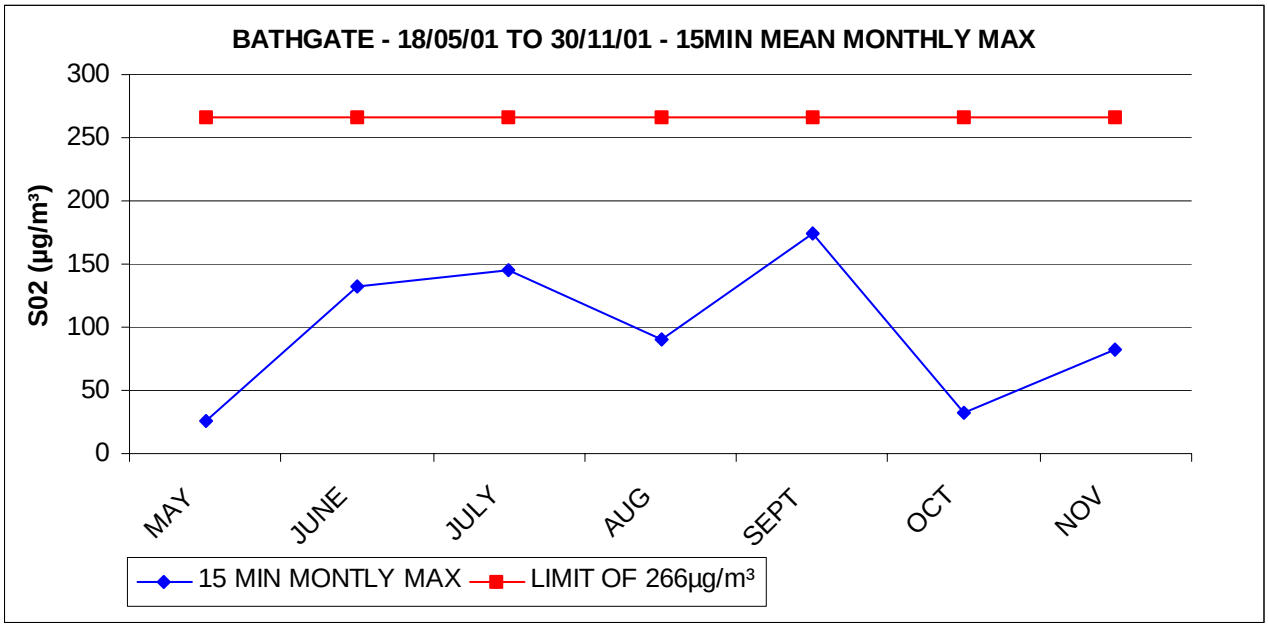


Figure 7.8 – The Steelyard, Bathgate – 18/05/01 to 30/11/01 - 1hr mean monthly max

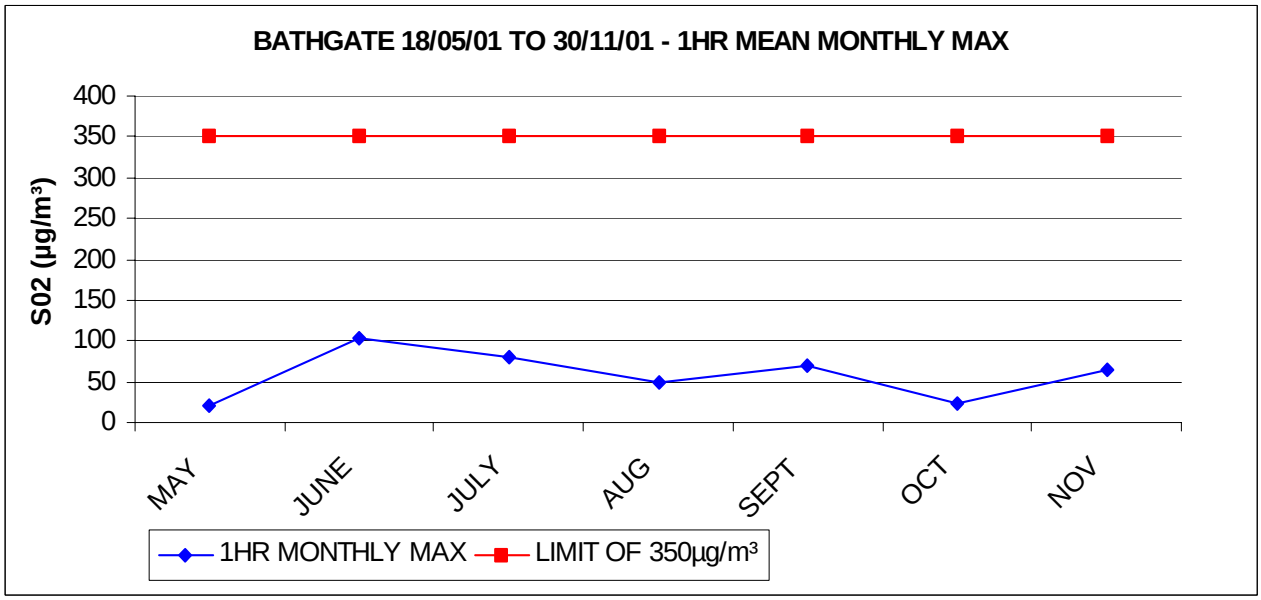
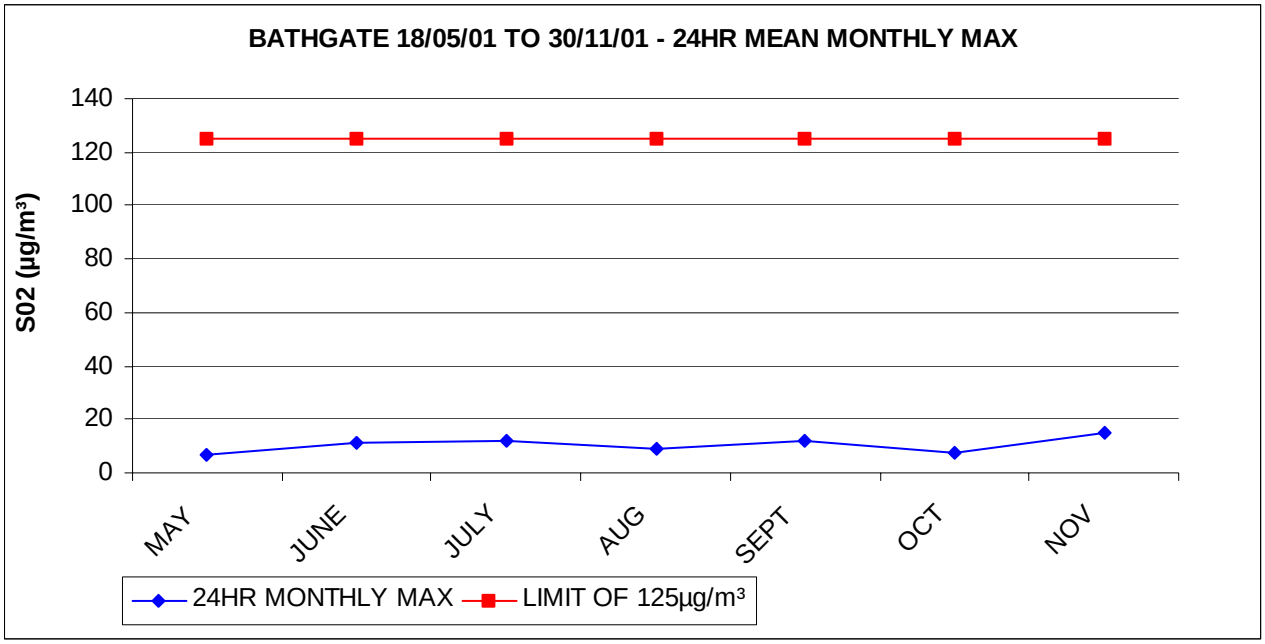


Figure 7.9 – The Steelyard, Bathgate – 18/05/01 to 30/11/01 - 24hr mean monthly max



From the graphs (figs 7.7 to 7.9), it can be seen that when the Groundhog was located at The Steelyard, Bathgate for six months, there were no exceedences for any of the three objectives.

LINLITHGOW HIGH ST, 15/12/01 TO 07/06/02

Figure 7.10 – Linlithgow High St – 15/12/01 to 07/06/02 - 15min mean monthly max

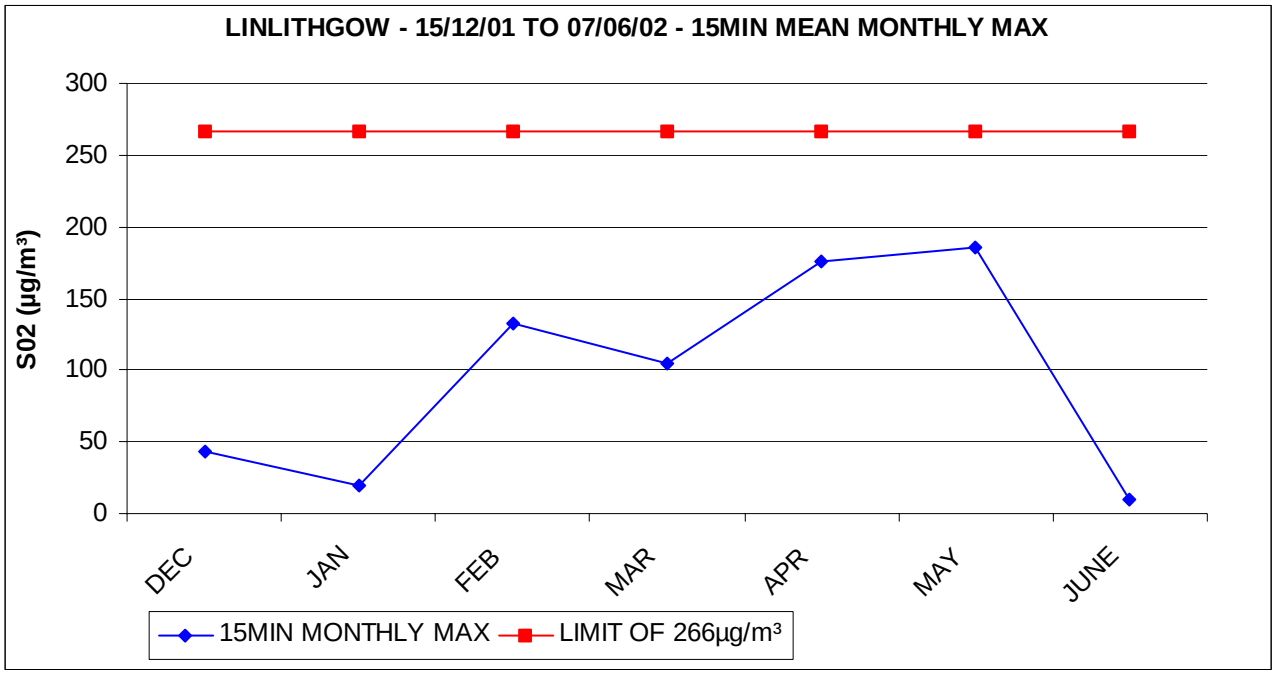


Figure 7.11 – Linlithgow High St – 15/12/01 to 07/06/02 - 1hr mean monthly max

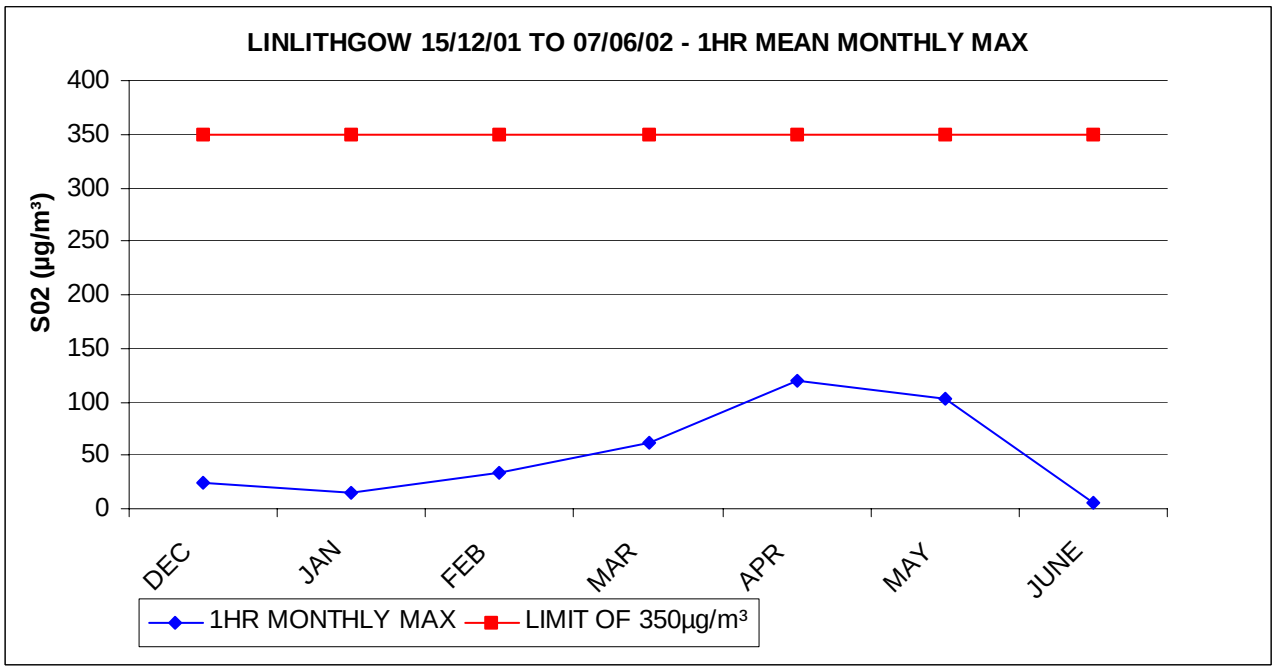
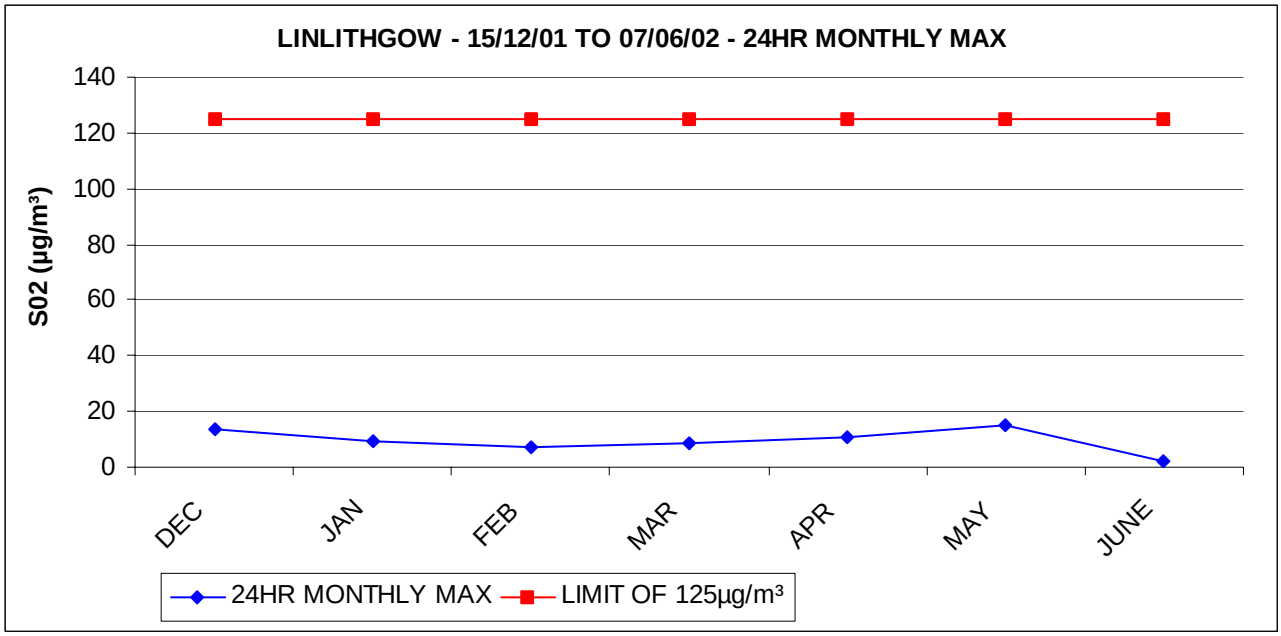


Figure 7.12 – Linlithgow High St – 15/12/01 to 07/06/02 - 24hr mean monthly max



From the graphs (figs 7.10 to 7.12) it can be seen that when the SO_2 real-time analyser was located back at Linlithgow High St from 15th December 2001 to 7th June 2002, there were no exceedences for any of the three objectives.

MANSE RD, WHITBURN – 12/07/02 TO 31/03/03

Figure 7.13 – Manse Rd, Whitburn – 12/07/02 to 31/03/03 - 15min mean monthly max

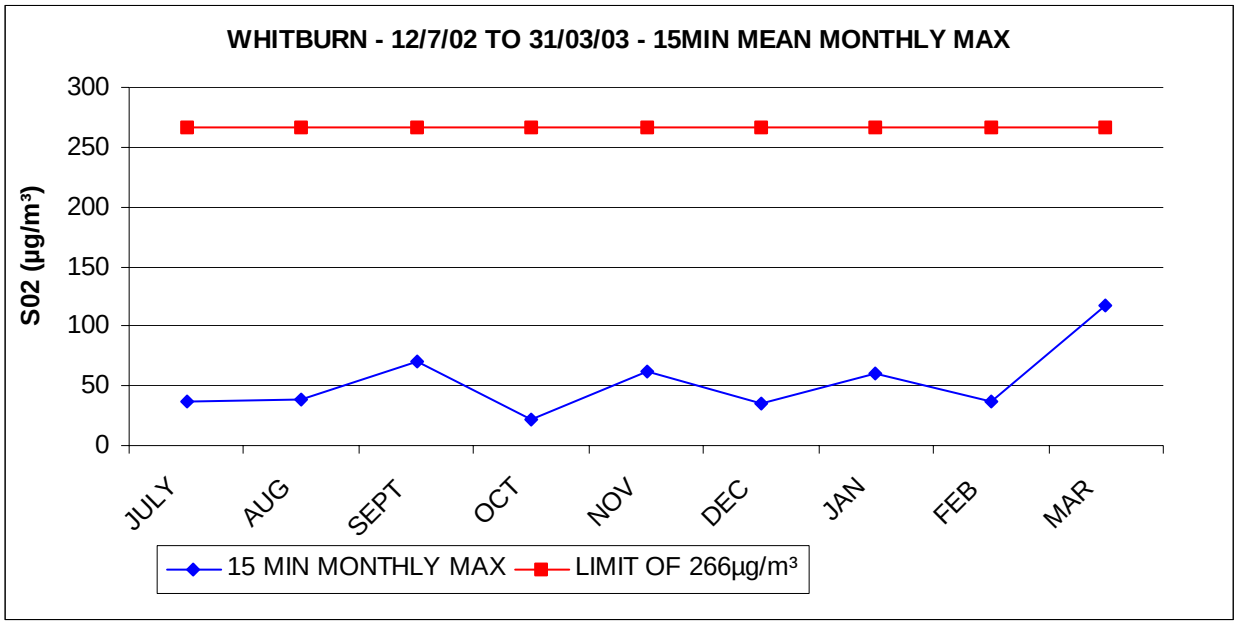


Figure 7.14 – Manse Rd, Whitburn – 12/07/02 to 31/03/03 - 1hr mean monthly max

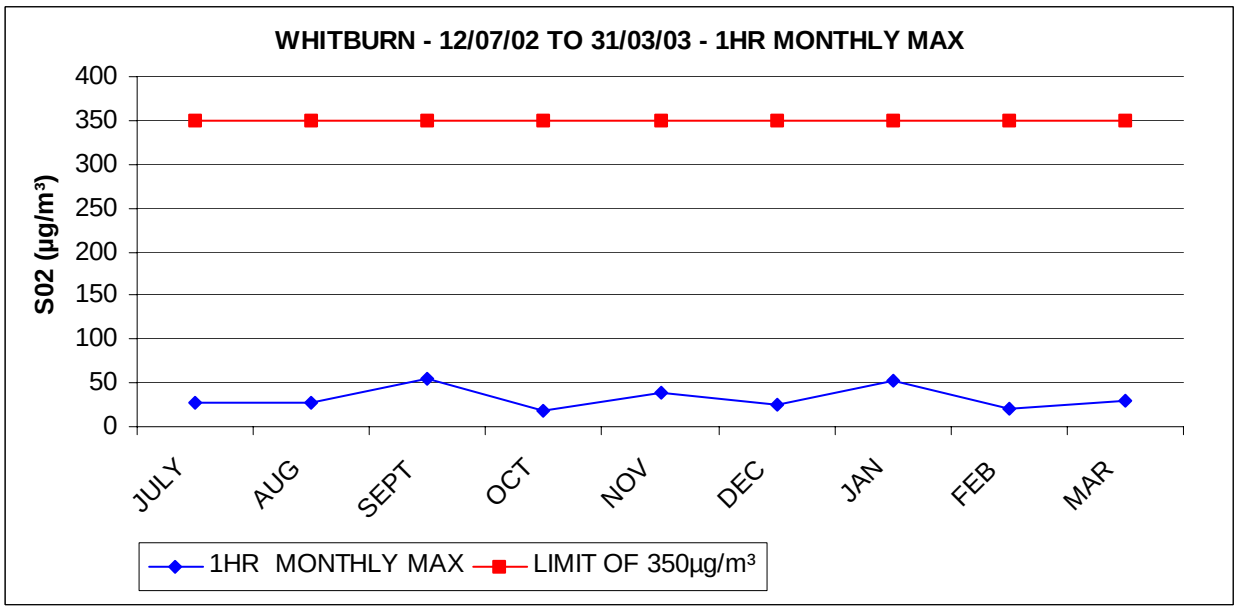
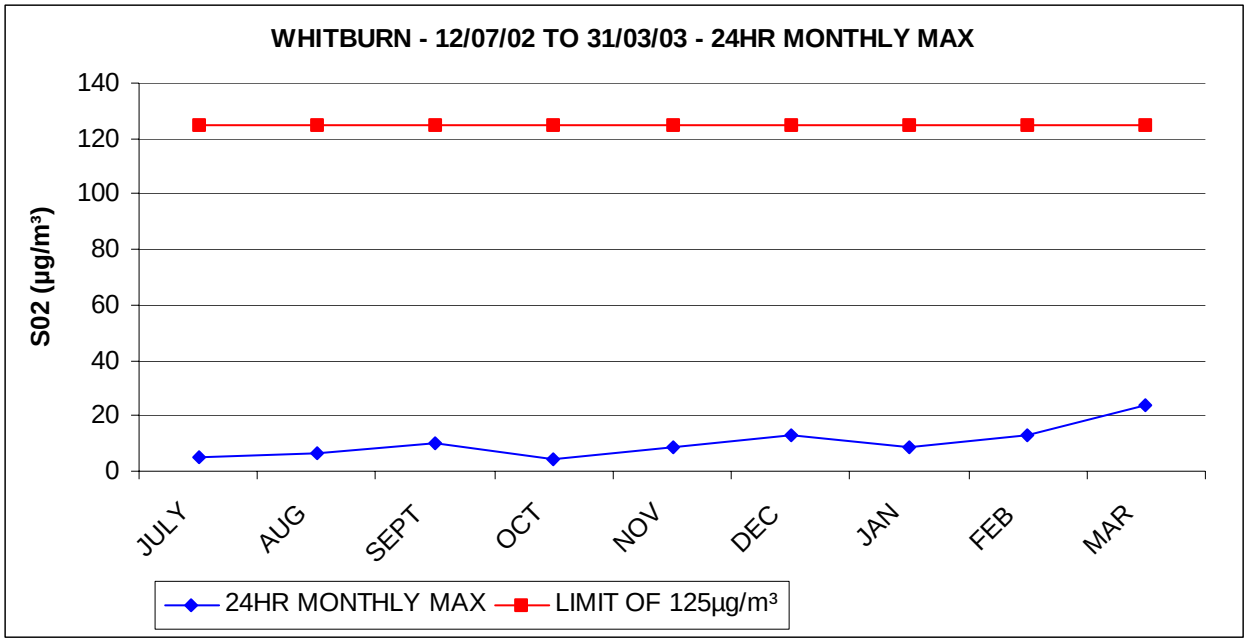


Figure 7.15 – Manse Rd, Whitburn – 12/07/02 to 31/03/03 - 24hr mean monthly max



It can be seen from the graphs (figs 7.13 to 7.15) that since the SO_2 real-time analyser has been located at Manse Rd, Whitburn, there have been no exceedences for any of the three objectives for sulphur dioxide.

8-port Bubbler Sulphur Dioxide Results – National Network Sites

There are currently two 8-port sites, which are on the air quality national network and these are Atlas Cottages, Armadale and Brucefield Church, Whitburn.
Atlas Cottages is located next to Caradale Brickworks and as stated in the first and second stage review & assessment of air quality it is the Brickworks that is responsible for the elevated SO2 concentrations at Atlas Cottages. Overall in West Lothian there is not a new problem with sulphur dioxide and there have not been any exceedences even at Atlas Cottages. This has also been demonstrated by the graphs (figs 7.1-7.15) using the real-time analyser.

Table 7.1 shows the maximum daily 24hr average at Atlas Cottages and Brucefield Church from 2000 to 2002.The 1hr means and 15min means have been calculated using a calculation taking from page 7-3 of the Technical guidance.

Calculations
15min mean = 1.8962 x 24hr maximum daily value
1hr mean = 1.3691 X 24hr maximum daily value
Table 7.1

SITE	YEAR	24HR MAX DAILY VALUE(μg/m3)	15min mean (μg/m3)	1hr mean (μg/m3)	Exceedences (Yes/No)
Atlas Cottages	2000	120	228	164.3	NO
Atlas Cottages	2001	85	161.3	116.4	NO
Atlas Cottages	2002	122	231	167	NO
Brucefield Church	2000	35	66.4	47.9	NO
Brucefield Church	2001	109	206.7	149.2	NO
Brucefield Church	2002	96	182	131.4	NO

The following graphs (figs 7.16 & 7.17) show the maximum daily 24-hour levels for the two 8-port bubblers located at Atlas Cottages, Armadale & Brucefield Church, Whitburn (Results 2000 to 2002).

Fig 7.16 – Atlas Cottages, Armadale – maximum daily 24-hour level

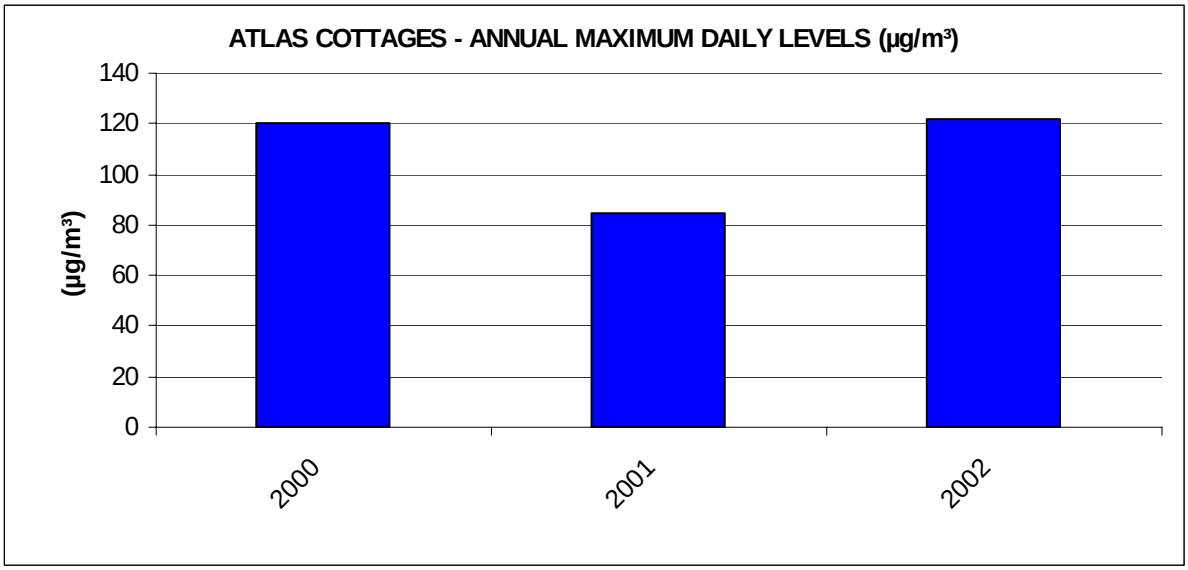
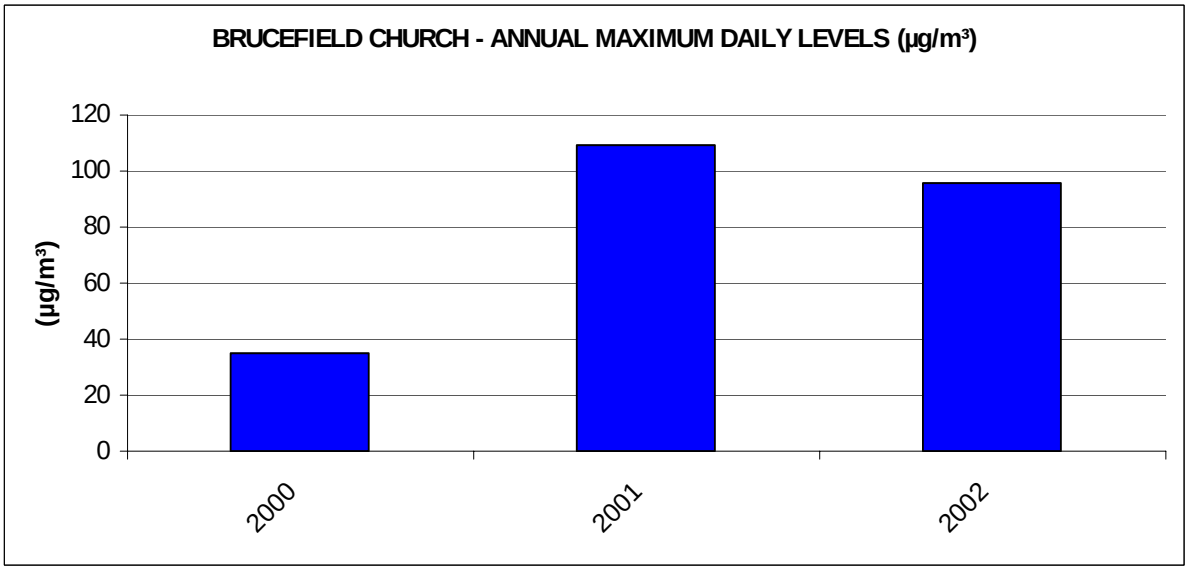


Fig 7.17 – Brucefield Church – maximum daily 24-hour level



Questions from Technical Guidance

Are there currently more than 35 15-minute exceedences of, or 99.9th percentiles greater than 266μg/m^3?
There have been no exceedences of the 15-minute objective in West Lothian .

Are there currently more than 24 1-hour exceedences of, or 99.7th percentiles greater than 350μg/m^3?
There have been no exceedences of the 1-hour objective in West Lothian.

Are there currently more than 3 24-hour exceedences of, or 99th percentiles greater than 125μg/m^3?
There have been no exceedences of the 24-hour objective in West Lothian.

Does the maximum daily mean bubbler result exceed 80μg/m^3
Yes, there have been some exceedences of 80μg/m^3 at both Atlas Cottages in 2000, 2001 & 2002 and Brucefield Church in 2001 & 2002.

However, real-time monitoring in Whitburn and four separate surveys in Armadale around the Caradale Brickworks have indicated that there is no requirement to proceed to a detailed assessment.

NEW INDUSTRIAL SOURCES

As notified by SEPA there are no new industrial sources of sulphur dioxide in West Lothian.

Industrial sources with substantially increased emissions
As notified by SEPA there are no industrial sources with substantially increased emissions of sulphur dioxide.

DOMESTIC SOURCES

Areas of domestic coal burning
There are no areas in West Lothian where significant coal burning takes place as most houses in West Lothian now have gas or electric central heating.

Boilers
There are no new boilers that have been identified since the First & Second stage review & assessment of air quality.

SHIPPING
This is not applicable as there is not a harbour in West Lothian.

RAILWAY LOCOMOTIVES
This is not applicable to West Lothian Council as all trains in West Lothian are passing through and do not stop at the station for any length of time.

CONCLUSION FOR SULPHUR DIOXIDE

The real-time monitoring results for the period 2000 to 2003 in town centre locations, Linlithgow, Bathgate and Whitburn indicate that there is no need to proceed to a detailed assessment. The bubbler method used at Atlas Cottages, Armadale next to the point source Caradale Brick works (Part B process) and the town centre location in Whitburn indicate that none of the three objectives are currently being exceeded. However, the maximum daily mean bubbler results do exceed 80$\mu g/m^3$ at Atlas Cottages in 2000, 2001 and 2002 and at Brucefield Church in 2001 and 2002. The Brucefield Church Bubbler site in Whitburn is located 100 to 200 metres to the east of the real-time SO_2 analyser located within the Groundhog at Manse Rd carpark, Whitburn and has been located there since July 2002. There is no industrial point source for SO_2 in Whitburn. On the evidence of the real-time monitoring data there is no requirement to proceed to a detailed assessment.
As detailed in the first and second stage review and assessment, four separate SO_2 real-time monitoring surveys have been undertaken around Caradale Brickworks, Armadale predominately at Atlas Cottages. The conclusions to these surveys and the first and second stage review and assessment were that there was no need to proceed to a third stage review and assessment. On the evidence of the real time monitoring data there is no requirement to proceed to a detailed assessment.

At a recent pollution working group, The Air Quality Management Specialist for the South East of Scotland of SEPA (John Lamb) did indicate that the real-time SO_2 Analyser owned by SEPA could possibly be used in conjuction with a Local Authority project. The Atlas Cottages site in Armadale may be a suitable site to do some further real-time monitoring and SEPA (John Lamb) shall be contacted to discuss the possibility.

CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions for Benzene

There are no significant industrial sources of benzene located either within West Lothian or neighbouring areas which, are likely to adversely affect air quality in West Lothian.

Monitoring has indicated that the two air quality standards and objectives of 16.25μg/m³ for 2003 and 3.25μg/m³ for 2010 are currently being complied with in West Lothian.

There is therefore, no requirement to proceed to a detailed assessment.

Recommendation for Benzene

Consideration should be given to expanding the benzene monitoring for a 12-month period to include locations near to the two petrol stations off the A899 in Livingston, at the Lizzie Bryce and Deer Park roundabouts.

2. Conclusions for 1,3 - Butadiene

There are no significant industrial sources of 1,3 - butadiene located either within West Lothian or neighbouring areas which, are likely to adversely affect air quality in West Lothian.

Monitoring has indicated that the air quality standard and objective of 2.25μg/m³ for 2003 is currently being complied with in West Lothian.

There is therefore, no requirement to proceed to a detailed assessment.

Recommendation for 1,3 – Butadiene

There is no need to do any further monitoring for this pollutant.

3. Conclusions for Carbon Monoxide

There are no significant industrial sources of carbon monoxide located either within West Lothian or neighbouring areas which, are likely to adversely affect air quality in West Lothian.

Real time monitoring has indicated that the air quality standard and objective of 10mg/m³ for 2003 is currently being complied with in West Lothian.

There is therefore, no requirement to proceed to a detailed assessment.

Recommendation for Carbon Monoxide

Monitoring for Carbon Monoxide should continue as the real time analyser is housed in the groundhog and in the future is most likely to be located in town centres, or near busy roads.

4. Conclusions for Lead

There are no new industrial sources of lead in West Lothian since the first stage review and assessment of lead. There are no industrial sources with substantially increased emissions of lead in West Lothian.

There is no requirement to proceed to a detailed assessment.

Recommendation for Lead

There is no need to do any monitoring for lead unless SEPA advise West Lothian Council that the authorised processes are substantially increasing emissions.

5. Conclusions for Nitrogen Dioxide

The real time monitoring locations were chosen as representing the worst case traffic conditions in West Lothian. They are all at or near junctions, traffic lights and pedestrian crossings, have residential properties close to the kerb and are busy streets where people may spend 1– hour or more close to traffic

There are no new industrial sources of Nitrogen dioxide in West Lothian since the first and second stage review and assessment. There are no industrial sources with substantially increased emissions of Nitrogen dioxide in West Lothian.

There are no new road sources of Nitrogen dioxide in West Lothian since the first and second stage review and assessment. There are no roads with significantly changed traffic flows since the first and second stage review and assessment.

The measured NO_2 concentrations at both real-time and diffusion tube sites and the predictions based on the real-time monitoring at the three Groundhog monitoring locations indicate that there have been no exceedences of the 1-hour mean of 200µg/m³. The 2005 annual mean objective of 40µg/m³ is currently being achieved and is predicted to be achievable in 2005.

There is no requirement to proceed to a detailed assessment.

Recommendation for Nitrogen Dioxide

Monitoring for Nitrogen Dioxide should continue in the future. The real time analyser is most likely to be located in busy town centres, near busy roads, or moved to areas where there is predicted to be a significant increase in traffic flow. It may be appropriate at some later date to identify an appropriate area in Livingston for a short term 3 – 6 month survey. It would also be helpful if Highways/Transportation had more detailed information on traffic flows, speeds, vehicle types etc in town centres as well as approach roads.

6. Conclusions for PM_{10}

The real time monitoring locations were chosen as representing the worst case traffic conditions in West Lothian. They are all at or near junctions, traffic lights and pedestrian crossings, have residential properties close to the kerb and are busy streets.

There are no new road sources of PM_{10} in West Lothian since the first and second stage review and assessment. There are no roads with significantly changed traffic flows since the first and second stage review and assessment.

There are no new industrial sources of Nitrogen dioxide in West Lothian since the first and second stage review and assessment. There are no industrial sources with substantially increased emissions of Nitrogen dioxide in West Lothian.

The measured PM_{10} concentrations at all three monitoring locations and the predictions based on the real-time monitoring at these locations indicate that the 2004 & 2010 objectives for PM_{10} can be achieved. Of concern is the fact that where exceedences have occurred in the busy town centres, the other PM_{10} monitoring locations outwith town centres and at background locations have shown similar exceedences. This would suggest that the

exceedences in the town centres are not solely attributable to traffic generated PM_{10} pollution but more so secondary PM_{10} from outwith the Council boundaries.

There is no requirement to proceed to a detailed assessment.

Recommendation for PM_{10}

Monitoring for PM_{10} should continue in the future. The real time analyser is most likely to be located in busy town centres, near busy roads, or moved to areas where there is predicted to be a significant increase in traffic flow.

It is this service units intention to ensure that any future opencasts, landfill sites, quarries or any other developments, likely to cause increase in PM_{10} are required to assess the likely local impact and to provide if necessary real time monitoring at appropriate receptors throughout the phases of the developments. This should ensure any exceedences of the 24–hour mean are minimised when trigger levels are allied to a dust control management plan.

7. Conclusions for Sulphur Dioxide

There are no new industrial sources of Sulphur dioxide in West Lothian since the first and second stage review and assessment. There are no industrial sources with substantially increased emissions of Sulphur dioxide in West Lothian.

The measured SO_2 concentrations at both real-time and bubbler method monitoring sites indicate that there have been no exceedences of the 1-hour mean of 350µg/m³, the 24-hour mean of 125µg/m³, or the 15-minute mean of 266µg/m³.

Recommendations for Sulphur Dioxide

Monitoring for Sulphur Dioxide should continue in the future. The groundhog is most likely to be located in busy town centres, near busy roads, or moved to areas where there is predicted to be a significant increase in traffic flow, to measure NO_2, CO and PM_{10}.
It may be necessary at some later date to remove the SO_2 analyser from the groundhog and use to monitor emissions from the burning bings at Polkemmet or Riddochhill during rehabilitation.
Consideration should be given to requesting the use of the real time SO_2 analyser owned by SEPA, to do some further monitoring at Atlas Cottages in Armadale, or the Polkemmet rehabilitation scheme.