Air Quality Progress Report for *Midlothian Council*

In fulfilment of Part IV of the Environment Act 1995
Local Air Quality Management

September 2011

Local Authority Officer	Lilianne Lauder, Principal Environmental Health Officer (Public Health)

Department	Communities and Wellbeing
Address	Fairfield House 8 Lothian Road Dalkeith EH22 3ZN
Telephone	0131 271 3370
e-mail	Lilianne.Lauder@midlothian.gov.uk

Report Reference number	Midl.PR.2011-9-30
Date	September 2011

Executive Summary

Midlothian Council has carried out a review of air quality within Midlothian which fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents.

The report sets out the results of air quality monitoring carried out by Midlothian Council and considers the potential impacts from a range of sources such as road traffic and other transport emissions, industrial processes, commercial and domestic fuel use and fugitive emission sources.

It was found that there were no new issues except the commissioning of a small scale hazardous waste incinerator at Pentland Science Park, Moredun in 2009 and the commissioning of a gas boiler and oil fired emergency boiler at the Community Hospital in Bonnyrigg. The impact of the incinerator and boilers on air quality at either site was not considered to be significant.

Prior to the opening of the A68 bypass, some measurements of nitrogen dioxide were reported between 2006 and 2008 as being above the annual mean objective at locations adjacent to the A68 in Dalkeith. Since the opening of the bypass in October 2008, monitoring data has shown that nitrogen dioxide concentrations have decreased significantly.

A refurbishment of Dalkeith High Street is being carried out during 2011 and it is envisaged that diversions during these major works will impact on air quality at monitoring locations in Dalkeith. The impact of these works will be considered and reported in Midlothian Council's 2012 Update and Screening Assessment Report.

Midlothian Council implemented some changes to nitrogen dioxide diffusion tube monitoring locations in February 2009, as some sites in Dalkeith were not representative of exposure locations. Theses have remained unchanged throughout the 2010 monitoring period.

The AQMA at Pathhead was declared in 2008 based on a predicted exceedence of 2010 PM_{10} levels at Pathhead. The annual mean concentration of PM_{10} measured by the TEOM and Partisol during 2009 was 17.0 µg/m^3 and 17.2 ug/m^3 respectively and in 2010 a level of 18.0 µg/m^3 was measured. Levels of PM_{10} within the Pathhead AQMA, whilst not exceeding the air quality objective, remain close to the objective.

A gas main is being installed into the village of Pathhead in 2011 and, as a result, it is envisaged that levels of PM_{10}, from the burning of coal will decrease towards the end of 2011 and into 2012, as the uptake of gas increases. Only after monitoring for a few years post installation of the gas mains and being able to demonstrate that PM_{10} levels have reduced and that the reduction will be sustained, will consideration be given to revoking the Pathhead AQMA.

An Action Plan is being prepared on this basis.

Bonnyrigg High Street was identified as a busy narrow congested street in 2008. As a result, additional diffusion tubes were deployed in this area to investigate potentially high concentrations of nitrogen dioxide. The results of the Detailed Assessment completed in 2010 indicated that nitrogen dioxide levels at locations close to the road network in the

centre of Bonnyrigg were within the air quality objective by some margin. Monitoring has continued at these locations and the results continue to remain well within the air quality objective.

Monitoring using the Partisol gravimetric monitoring system resumed in August 2010. The results from the Partisol will provide accurate PM_{10} levels pre and post installation of the gas mains. The results of this monitoring will be reported in the 2012 Update and Screening Assessment report.

The next course of action for Midlothian Council in the Review and Assessment process is summarised as:

- Submit an Update and Screening Assessment Report by 30 April 2012
- Submit an Air Quality Action Plan

Table of contents

Appendices

Figures

1 Introduction

1.1 Description of Local Authority Area

Despite being relatively small in size, Midlothian occupies a key location on the southern boundary of Scotland's capital. All of Midlothian's main centres of population lie within 30 minutes drive from Edinburgh, while Dalkeith is only 6 miles from the city centre. Midlothian comprises a number of small and medium-sized towns, together with many villages and hamlets and it is not dominated by any single centre. Penicuik is the largest town with a population of around 17,000, followed in size by Bonnyrigg and Dalkeith with populations of about 14,000 and 11,000 respectively. Loanhead, Gorebridge, Mayfield and Newtongrange are smaller settlements. A schematic map of Midlothian showing villages, towns and roads within the district is shown in Figure 1.

Midlothian is largely a countryside setting. The area stretches from the Pentland Hills to the Moorfoots and Lammermuirs, and comprises a gently sloping plain, much of it intensively farmed, rising to moorland with upland country beyond. There are deeply incised river gorges of the Esk and Tyne with dense natural woodland. Much of this landscape is protected by policy designations such as the Green Belt.

There are no large industrial processes in Midlothian and the main issues with regards to air quality are due to road traffic emissions, particularly in the busy town and village centres where congestion occurs. Another main issue is domestic solid fuel combustion due to the rural setting of Midlothian and limited mains gas supply to many villages. There are also a number of open cast coal mining and landfill sites in Midlothian.

1.2 Purpose of Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process and provide information on new monitoring results and new developments which could affect air quality in the council area.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre, $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Scotland.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	50 $\mu g/m^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	40 $\mu g/m^3$	Annual mean	31.12.2004
	18 $\mu g/m^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

1.4.1 First Round of Review and Assessment, 1998 – 2001

The assessment of local air quality was undertaken initially as a three stage process using increasingly detailed levels of assessment. Midlothian Council has previously completed Stages 1 to 3 of the first round of the Review and Assessment process.

The Stage 1 report concluded that further assessment of nitrogen dioxide, PM_{10}, sulphur dioxide and lead was required due to emissions from traffic, industrial and domestic sources. The Stage 2 report concluded that no further assessment was required for PM_{10}, sulphur dioxide and lead. A more detailed assessment of nitrogen dioxide was recommended at Stage 3 for road traffic emissions in the centre of Dalkeith. On the basis of continuous analyser monitoring and dispersion modelling results, the Stage 3 report concluded that the air quality objectives for nitrogen dioxide were not at risk of being exceeded at sensitive receptor locations in Dalkeith centre and therefore the declaration of an air quality management area was not required.

1.4.2 Second Round of Review and Assessment, 2003 – 2005

Updating and Screening Assessment 2003

Following completion of reports for the first phase of Review and Assessment, there were potentially a number of issues that needed to be addressed in terms of changes to the sources and emissions of pollutants that may have affected ambient air quality in local authority areas. Furthermore, new policy developments and revisions to published guidance required consideration within the on-going assessment of air quality.

The updating and screening assessment was based on a checklist approach, whereby sources identified in the first round of Review and Assessment and any new or altered emissions sources were reviewed with regard to their current significance and any requirement for further, more detailed, assessment.

The Updating and Screening Assessment completed in early 2004 concluded that a Detailed Assessment was required for nitrogen dioxide and PM_{10} levels due to road traffic emissions in Dalkeith centre. The screening assessment indicated that a survey of domestic fuel use was required for two villages in Midlothian; Cousland and Pathhead.

Detailed Assessment 2004

The Detailed Assessment report completed in 2005 by Midlothian Council concluded that PM_{10} levels in Dalkeith centre would comply with the air quality objectives for the target years of 2004 and 2010. Nitrogen dioxide levels were also predicted not to exceed the relevant air quality objectives. However, further monitoring was recommended to provide more data of improved reliability. The updated results of this survey are set out in this report.

The survey of domestic fuel use in Cousland and Pathhead indicated a more detailed assessment of PM_{10} and sulphur dioxide levels was required in Pathhead. Midlothian Council committed to carry out the monitoring in the winter period of September 2005 to March 2006. The results of the monitoring were incorporated into the next round (the third

round) of the review and assessment process (i.e. the Updating and Screening Assessment 2006).

Progress Report 2005

The Progress Report submitted in 2005, and updated in 2006, provided an update on local air quality issues in Midlothian and focused on the latest monitoring results and updates to industrial processes and developments. The report concluded that there were no areas of immediate concern. The proposed Dalkeith by-pass was anticipated to lead to a considerable decrease in pollution levels in the centre of Dalkeith. It was recommended that additional monitoring be undertaken to reinforce these findings in Dalkeith and also at the village of Pathhead following the recommendations in the Detailed Assessment 2004 report.

1.4.3 Third Round of Review and Assessment, 2006 – 2008

Updating and Screening Assessment 2006

The Updating and Screening Assessment completed in 2006 concluded that measured concentrations of PM_{10} at Pathhead were above the 2010 annual mean objective value. As the monitoring period was less than one year, it was concluded that further monitoring be carried out and the results reported in a Detailed Assessment in 2007. Although it was concluded that there had been no significant changes with regards to emissions and measurements of all other substances, it was recommended that the existing monitoring programme be continued to confirm the trend in pollution levels.

Detailed Assessment 2007

The Detailed Assessment completed in 2007 focused on PM_{10} levels in Pathhead due to domestic coal burning and road traffic emissions. The results of the monitoring campaign indicated that the levels of PM_{10} are predicted to exceed the annual mean air quality objective by the target date of 2010. Further analysis was undertaken using dispersion modelling which confirmed the monitoring results. On this basis, Midlothian Council committed to declaring an AQMA in Pathhead.

The AQMA in Pathhead came into force on 30 April 2008 and covers the entire village as shown in Figure 2. Midlothian Council aims to carry out a Further Assessment to confirm the original assessment, calculate the improvement required and refine its knowledge of the sources of pollution. Midlothian Council is also committed to preparing an Air Quality Action Plan, as necessary, once the Further Assessment is completed.

Progress Report 2008

The Progress Report submitted in 2008, provided an update on local air quality issues in Midlothian and focused on the latest monitoring results and updates to industrial processes and developments. The monitoring data confirmed the declaration of the AQMA at Pathhead. Some diffusion tube measurements at locations in Dalkeith were above the annual mean nitrogen dioxide objective. However, these locations were not representative of long term human exposure locations. Midlothian Council committed to reviewing the diffusion tube monitoring locations and considering whether the survey also needs to be expanded to cover Loanhead and Bonnyrigg, where increased traffic congestion has occurred. Some minor changes to industrial processes and plans for developments such as Park and Rides, a new town and re-opening of a rail link were identified. It was concluded that a Detailed Assessment was not required.

1.4.4 Fourth Round of Review and Assessment, 2009 – 2011

Air Quality Update Screening and Assessment 2009

The Updating and Screening Assessment completed in 2009 concluded that measured concentrations of PM_{10} at Pathhead in 2008 complied with the annual mean and 24–hour mean air quality objectives for 2004 but the annual mean concentration of 19.6 µg/m^3 was above the 2010 annual mean objective. When using the approach set out in Box 2.2 of LAQM.TG(09) (Ref.1) the predicted concentration for 2010 was 18.4 µg/m^3 and therefore above the annual mean objective. The 2009 Updating and Screening Assessment concluded that the air quality objective for PM_{10} was forecast to be exceeded by a small margin in 2010. A gravimetric Partisol sampler was installed at Pathhead in early 2009 and the gravimetric results would be used to confirm if the 2010 annual mean objective would be exceeded in Pathhead.

Although measurements of nitrogen dioxide were above the annual mean objective value at three locations in Dalkeith, the opening of the Dalkeith Bypass in September 2008 (during the measurement period) was expected to reduce nitrogen dioxide concentrations in future years to below the objective value. This was demonstrated by comparing the period of measurement subsequent to the bypass opening with the same period in previous years.

It was identified that concentrations of nitrogen dioxide in the High Street, Bonnyrigg required a Detailed Assessment due to the identification of a narrow congested street with more than 5,000 vehicles per day. Additional monitoring has been carried out during 2009 in Bonnyrigg to inform the Detailed Assessment.

No issues were identified with regard to the other aspects addressed in the Updating and Screening Assessment. Although it was concluded that there had been no significant changes with regards to emissions and measurements of all other substances, it was recommended that the existing monitoring programme be continued to confirm the trend in pollution levels.

Progress Report and Detailed Assessment Report 2010

The Progress and Detailed Assessment Report completed in 2010 provides an update on the results of air quality monitoring in Midlothian. It focussed on measured PM_{10} levels in Pathhead and confirms that the AQMA should remain in place as the measured PM_{10} concentrations remain close to the 2010 air quality objective of 18 ug/m^3.

Monitoring of nitrogen dioxide indicated that concentrations adjacent to busy roads were within the annual mean air quality objective and that there had been a measurable decrease in nitrogen dioxide concentrations at some of the locations within Dalkeith, adjacent to the A68.

The Update and Screening Assessment 2009 identified the need for a detailed Assessment of nitrogen dioxide levels at Bonnyrigg due to the identification of a narrow congested street with more than 5,000 vehicles per day. Additional diffusion tube monitoring was carried out in 2009 at relevant roadside locations in Bonnyrigg. The measured concentrations at these locations were significantly below the annual mean air quality objective and although no further assessment was necessary the new diffusion tube locations were maintained.

In addition to two new passive diffusion sites in Bonnyrigg, monitoring was also established at three new sites in Loanhead. The results of monitoring at the new sites are reported in the 2011 Progress Report. No concerns have arisen from any of the new monitoring locations.

Copies of the previous LAQM reports are available on request to Midlothian Council.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

Midlothian Council continues to measure levels of nitrogen dioxide, PM_{10} and sulphur dioxide at the continuous monitoring station in Dalkeith centre and PM_{10} and sulphur dioxide at the continuous monitoring station in Pathhead. Both of these monitoring stations are classified as roadside locations. The Dalkeith station is within 5m of the kerb of the High Street (A6094), close to the junction with South Street (A68). The Pathhead station is approximately 1 – 2m from the kerb of Main Street (A68). A Partisol gravimetric sampler was installed at the Pathhead monitoring station location in March 2009 and this was operated simultaneously with the existing TEOM analyser.

Following collection of a full year's data, the Partisol was decommissioned in February 2010. As measured PM_{10} levels remained very close to the annual mean objective, the Partisol was re-commissioned again in August 2010 to continue to provide accurate data in relation to PM_{10} levels in Pathhead.

The Council also measures nitrogen dioxide levels using passive diffusion tubes at several locations across Midlothian. These locations are in the towns of Dalkeith, Penicuik, Bonnyrigg and Loanhead and in the village of Pathhead. The location of the monitoring stations and diffusion tube measurements are shown in Figures 3 – 7.

No monitoring of other pollutants has been undertaken in Midlothian. The previous local air quality management reports showed that the air quality objectives for other specified pollutants are unlikely to be exceeded and, on this basis, no monitoring for other pollutants was considered necessary.

A summary of the Quality Assurance/Quality Control (QA/QC) procedures and the data management arrangements is provided in Appendix A.

2.1.1 Automatic Monitoring Sites

Midlothian Council operates two automatic monitoring stations. One station is located in Dalkeith town centre and the other station is located in the centre of Pathhead village. Further details of the monitoring stations are provided in Table 2.1. The location of the Dalkeith Centre and Pathhead monitoring stations are shown in Figure 3 and 4, respectively.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQ MA ?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case location?
Dalkeith Centre	Roadside	X 333153 Y 667298	NO_2 PM_{10} (TEOM) SO_2	N	N (>10m)	3m	Y
Pathhead	Roadside	X 339585 Y 664203	PM_{10} (TEOM) PM_{10} (Grav.) - re-commissioned Aug 2010 SO_2	Y *	Y (4m)	1m	Y

* AQMA declared for PM_{10}

The maintenance of the two monitoring stations at Dalkeith and Pathhead is carried out by Casella Monitor. This involves two routine services per year and also provision for emergency callouts. Casella Monitor also has the data management contract and collects all the raw data from each of the monitoring stations. The data are checked to ensure that the data is being recorded correctly, the analysers are stable and there are no faults with the analysers. The data is then re-scaled by Casella Monitor using the results of calibration and span checks which are carried out by the analyser automatically or carried out manually by Midlothian Council every two weeks. The manual checks carried out by Midlothian Council include a span check in which a gas of known concentration is passed through the analysers and the measured concentrations and other operating parameters are recorded by the operator and sent to Casella Monitor. The raw and re-scaled data are sent by Casella Monitor to Midlothian Council at regular periods. The Partisol filter changes are carried out by Midlothian Council on a fortnightly basis and the analysis for weight gain is carried out by Environmental Scientifics Group.

Further work has also been carried out by AEA Technology with regards to the QA/QC procedures for the Dalkeith and Pathhead monitoring stations to satisfy the requirements in LAQM.TG(09) (Ref. 1) and include the stations on the Air Quality in Scotland website (www.scottishairquality.co.uk). The work includes 6-monthly audits and servicing, and data ratification. Audits of the monitoring site consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair. The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data is appropriately scaled. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.

PM_{10} is measured at both monitoring stations using Tapered Element Oscillating Microbalance (TEOM) units. The concentrations recorded during 2010 from these analysers were corrected using the Volatile Correction Model (VCM) by AEA Technology as part of the data management for the Air Quality in Scotland Website (Ref. 2). The model allows TEOM measurements to be corrected for the loss of volatile components that occur due to the high sampling temperatures employed by the TEOM instrument. The corrected measurements are considered to be equivalent to the gravimetric reference equivalent for PM_{10} measurements. This method was also utilised by Casella Monitor under the data management contract. However, the VCM data provided by AEA Technology was utilised for this report. A summary of the ratified data produced by AEA for Pathhead and Dalkeith are given in Appendixes C and D respectively.

2.1.2 Non-Automatic Monitoring

Monitoring of nitrogen dioxide using passive diffusion tubes was undertaken at 14 separate locations in Midlothian until end January 2009, at which time the number of passive diffusion tubes increased to 20. The diffusion tube locations are shown in Figures 3 to 7. The diffusion tube locations are described in Table 2.2. As locations J2 and ED1 were not directly representative of relevant exposure locations, Midlothian Council committed to reviewing these monitoring locations by the end of 2008. It is confirmed that ED1 was moved in February 2009, as a result of the review, and measured concentrations reported for 2009 onwards are based on the updated locations. On further assessment a better location could not be found for J2 and therefore this tube location was not altered.

Table 2.2 Details of Nitrogen Dioxide Diffusion Tube Monitoring Locations

Site Name	Location	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location ?
BR1	Bonnyrigg	Roadside	X 330890 Y 665222	NO_2	N	Y (0m)	2.5 m	Y
BR2	Bonnyrigg	Roadside	X 330973 Y 665213	NO_2	N	Y (0m)	2 m	Y
J1 (1, 2 and 3) *	Dalkeith	Roadside	X 333153 Y 667298	NO_2	N	N (>10m)	3 m	N/A
J2	Dalkeith	Roadside	X 333180 Y 667283	NO_2	N	N (>10m)	0.5 m	N/A
E1 *	Dalkeith	Urban Background	X 333374 Y 667222	NO_2	N	Y (5m)	N/A	N/A
BD1	Dalkeith	Roadside	X 333049 Y 667177	NO_2	N	Y (1m)	1 m	Y
ED1	Dalkeith	Roadside	X 333213 Y 667363	NO_2	N	Y (1m)	1 m	Y
ED2	Dalkeith	Roadside	X 332995 Y 667118	NO_2	N	Y (0.5m)	2 m	Y
X1	Dalkeith	Roadside	X 332963 Y 667389	NO_2	N	Y (1.5m)	1.5 m	Y
HD1	Dalkeith	Roadside	X 333311 Y 667457	NO_2	N	Y (2m)	1.5 m	Y
ND1	Dalkeith	Roadside	X 333409 Y 667057	NO_2	N	Y (2m)	1.5 m	Y
DL1	Dalkeith	Roadside	X 333250 Y 667074	NO_2	N	Y (0m)	2 m	Y
LH1	Loanhead	Roadside	X 328232 Y 665580	NO_2	N	Y (1.5m)	0.5 m	Y
SN1	Loanhead	Roadside	X 327142 Y 666337	NO_2	N	Y (3m)	0 m	Y
SN2	Loanhead	Roadside	X 327262 Y 666588	NO_2	N	Y (0m)	3.5 m	Y
P1 *	Penicuik	Urban Background	X 323146 Y 659818	NO_2	N	Y (0.5m)	N/A	N/A
P2 *	Penicuik	Roadside	X 323677 Y 661000	NO_2	N	Y (2m)	2.5 m	Y
P3	Penicuik	Roadside	X 323551 Y 659725	NO_2	N	Y (0.5m)	1.5 m	Y
PD1	Pathhead	Roadside	X 339601 Y 664172	NO_2	Y	Y (3.5m)	1.5 m	Y
PD2	Pathhead	Roadside	X 339450 Y 664310	NO_2	Y	Y (3.5m)	2 m	Y

* tube results sent monthly to Netcen as part of the Nitrogen Dioxide Diffusion Tube Network reporting

The nitrogen dioxide diffusion tubes are placed at each location by Midlothian Council for a period of approximately one month, based on a pre-arranged timetable provided by Netcen. At the end of each monitoring period, the exposed tubes are replaced with new tubes and the exposed tubes are sent to the laboratory for analysis. The analysis is carried out by Edinburgh Scientific Services (ESS), part of the City of Edinburgh Council. ESS has confirmed that the procedures set out in the Harmonisation Practical Guidance are followed during the analysis. The laboratory is UKAS accredited for the analysis and also participates in the Workplace Analysis Scheme for Proficiency (WASP) scheme. ESS has reported that the results from the WASP scheme confirm that the laboratory is performing satisfactorily and the bias has been close to zero for several years. The laboratory uses the 50% v/v

triethanolanine (TEA) in acetone method where the adsorbent pads are dipped into this solution, dried and then inserted into the acrylic diffusion tubes. All exposure times and dates are recorded by Midlothian Council and sent to the laboratory with the exposed tubes. Midlothian Council also sends one unexposed tube with each batch to check that there has been no contamination during the analysis.

2.2 Comparison of Monitoring Results with Air Quality Objectives

This section sets out the results of all the monitoring carried out by Midlothian Council in 2010 and, where relevant, provides results from previous years to identify any trends.

2.2.1 Nitrogen Dioxide

The results of the nitrogen dioxide monitoring at the automatic station in Dalkeith and diffusion tube locations across Midlothian are presented below.

Automatic Monitoring Data

The results of the automatic monitoring are set out in Table 2.3a and Table 2.3b.

Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data capture	Annual mean concentration 2010 ($\mu g/m^3$)
Dalkeith Centre	Dalkeith	N	97.9%	25.0

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-Hour Mean Objective

Site ID	Location	Within AQMA?	Data capture	Number of exceedences of hourly mean 2010 (200 $\mu g/m^3$)
Dalkeith Centre	Dalkeith	N	97.9%	0

The annual mean concentrations and hourly exceedences recorded by the continuous monitoring station from 2004 – 2010 are shown in Table 2.3c.

Table 2.3c Results of Automatic Monitoring for Nitrogen Dioxide at Dalkeith Centre 2004 – 2010

Parameter	Unit	Value						
		2004	2005	2006	2007	2008	2009	2010
Annual Mean	$\mu g/m^3$	24	26	26	26	28	21	25
Number of exceedences of hourly mean (200 $\mu g/m^3$)	Days	0	0	0	0	0	0	0

The results presented in Table 2.3c indicate that, at the monitoring station, the annual mean concentrations of nitrogen dioxide show an increasing trend since 2004 and a sharp decrease in 2009. This increase from 2004 – 2008 is consistent with the trend recorded at the Edinburgh St Leonards monitoring station (the closest station with available data) over the same period. The drop in 2009 is attributed to the opening of the Dalkeith Bypass. An increase is noted again in 2010. Nitrogen dioxide levels in Dalkeith will continue to be monitored in subsequent years and reported in terms of the LAQM process.

Diffusion Tube Monitoring Data

The diffusion tube method is open to a degree of uncertainty in the method and, as such, the results of the survey should be treated with some caution and used as indicators of nitrogen dioxide levels only. Bias correction methods have been developed to reduce the error in the results of the diffusion tube survey. The most robust of these methods is co-location of diffusion tubes with a continuous monitor to calculate the tube bias. For this purpose, Midlothian Council has co-located triplicate diffusion tubes at the Dalkeith Centre continuous monitoring station since 2005. The results of the co-location study in 2010 bias adjustment data and calculations are shown in Appendix A. The study resulted in a bias adjustment factor of 0.76. This means that the diffusion tube results are significantly higher than the continuous monitoring results. Overall, the tube precision for the co-location study was calculated as good. The national bias adjustment factor reported in the Spreadsheet of Bias Adjustment Factors (version 06/11) produced by Defra and the Devolved Administrations (Ref. 3) for this laboratory and analysis method is 1.02. This is based on 2 co-location studies; West Lothian and Marylebone Road. It was decided to use Midlothian's local bias adjustment factor of 0.76 as this was considered to be more representative.

The bias adjustment factor was applied to the diffusion tube results situated at roadside locations only as the co-location study is based on roadside measurements. Diffusion tubes located at urban background locations were not adjusted.

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture	Annual mean concentration 2010 ($\mu g/m^3$) Adjusted for bias *
J2	Dalkeith	N	83.3%	26.4
E1	Dalkeith	N	83.3%	15.2
BD1	Dalkeith	N	83.3%	34.0
ED1	Dalkeith	N	83.3%	35.2
ED2	Dalkeith	N	83.3%	24.2
X1	Dalkeith	N	83.3%	18.5
HD1	Dalkeith	N	83.3%	15.4
ND1	Dalkeith	N	83.3%	26.6
DL1	Dalkeith	N	83.3%	27.1
P1	Penicuik	N	83.3%	8.5
P2	Penicuik	N	83.3%	22.3
P3	Penicuik	N	83.3%	13.6
PD1	Pathhead	Y	83.3%	18.5
PD2	Pathhead	Y	83.3%	17.5
BR1	Bonnyrigg	N	83.3%	22.7
BR2	Bonnyrigg	N	83.3%	20.5
LH1	Loanhead	N	83.3%	23.9
SN1	Loanhead	N	83.3%	22.7
SN2	Loanhead	N	83.3%	26.6

** Bias adjustment factor of 0.76 applied to Roadside measurements*

The results set out in Table 2.4a indicate that the measured concentrations of nitrogen dioxide are within the annual mean air quality objective.

The measured nitrogen dioxide concentrations reported in the 2009 Update and Screening Assessment were above the annual mean air quality objective of 40µg/m^3at three diffusion tube locations (ND1, J2 and ED1). All these tube locations are located adjacent to the A68 in Dalkeith and measured increasing concentrations of nitrogen dioxide since 2005 (see Table 2.4b). The Dalkeith Bypass opened in September 2008 resulting in reduced numbers of vehicles travelling through Dalkeith town centre. Consequently, measured concentrations of nitrogen dioxide within Dalkeith town centre have significantly decreased as a result.

Details on the trends and impact of the Dalkeith Bypass are set out in Table 2.4b. Measurements of nitrogen dioxide will continue, as normal, to evaluate the effects of the Dalkeith Bypass and the wider trends in nitrogen dioxide concentrations.

Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes 2005 – 2010

Site ID	Location	Annual mean concentration ($\mu g/m^3$) Roadside measurements adjusted for bias					
		2005	2006	2007	2008	2009	2010
J2	Dalkeith	34.3	38.6	43.4	43.6	33.5	26.4
E1	Dalkeith	11.5	12.3	14.4	14.0	13.3	15.2
BD1	Dalkeith	30.3	41.0	40.8	37.6	33.9	34.0
ED1	Dalkeith	35.8	40.4	43.0	40.8	37.1	35.2
ED2	Dalkeith	27.5	27.9	29.8	28.5	27.8	24.2
X1	Dalkeith	25.1	30.5	29.7	28.0	23.8	18.5
HD1	Dalkeith	16.4	17.9	19.8	18.2	18.1	15.4
ND1	Dalkeith	39.6	48.8	52.5	48.3	31.0	26.6
DL1	Dalkeith	N/A	N/A	N/A	N/A	35.7	27.1
P1	Penicuik	7.1	5.8	7.4	6.1	6.7	8.5
P2	Penicuik	22.6	28.6	27.0	23.8	25.5	22.3
P3	Penicuik	15.5	16.2	17.1	14.8	14.7	13.6
PD1	Pathhead	17.1	16.1	19.4	19.7	19.8	18.5
PD2	Pathhead	14.5	17.9	19.3	17.1	20.1	17.5
BR1	Bonnyrigg	N/A	N/A	N/A	N/A	25.7	22.7
BR2	Bonnyrigg	N/A	N/A	N/A	N/A	23.5	20.5
LH1	Loanhead	N/A	N/A	N/A	N/A	25.2	23.9
SN1	Loanhead	N/A	N/A	N/A	N/A	27.6	22.7
SN2	Loanhead	N/A	N/A	N/A	N/A	28.2	26.6

Sites marked N/A were new from February 2009

* diffusion tube location moved during 2009 (see Figure 3)

The results presented in Table 2.4b are presented graphically in Figure 8 to illustrate any trends. The results indicate that concentrations of nitrogen dioxide measured across Midlothian were either relatively constant or slightly increasing up to 2007 with a decrease in 2008 at most diffusion tube locations. The results set out in Table 2.4b indicate that there was a further decrease in concentrations in 2009 at diffusion tube locations in Dalkeith due to the opening of the Dalkeith Bypass, with a small reduction in 2010. The greatest reduction was been observed at diffusion tube location ND1 (where the highest concentration of nitrogen dioxide was previously recorded). This comparison is shown in Table 2.4c.

Table 2.4c Results of Nitrogen Dioxide Diffusion Tube ND1 for 2005 – 2010

Site ID	Location	Average concentration of NO_2 ($\mu g/m^3$) Adjusted for bias					
		2005	2006	2007	2008	2009	2010
ND1	Dalkeith	39.6	48.8	52.5	48.3	31.0	26.6

2.2.2 PM_{10}

PM_{10} levels are monitored at Dalkeith and Pathhead using a TEOM analyser. In March 2009, monitoring of PM_{10} levels at Pathhead commenced using a Partisol gravimetric sampler. This allowed a more accurate determination of the PM_{10} concentration for comparison to the air quality objectives which are based on a gravimetric technique. It also allowed additional analysis of the collected particulate material to provide information for source apportionment. The Partisol measurement results and additional analysis of the PM_{10} fraction was reported in detail in the 2010 Further Assessment. The use of the Partisol was discontinued after one full year of monitoring. Monitoring using the Partisol in Pathhead resumed in August 2010 as the monitoring VCM corrected results using the TEOM were borderline with regard to the air quality objective and it was agreed with Scottish Government that continued monitoring using the Partisol would be useful. The results for the 2011 monitoring period will be reported in the 2012 Update and Screening Assessment Report.

The results of the automatic monitoring using the TEOM analysers are set out in Table 2.5a and Table 2.5b. The TEOM measurements were corrected by AEA Technology using the VCM correction method as discussed in Section 2.1.1.

Table 2.5a Results of PM_{10} Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2010	Annual mean concentrations ($\mu g/m^3$)			
				2007	2008	2009	2010
Dalkeith Centre	Dalkeith	N	98.3%	16.1	15.0	14.4	16.0
Pathhead	Pathhead	Y	91.0%	19.9	19.6	17.2	18.0

Table 2.5b Results of PM_{10} Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2010s	Number of Exceedences of daily mean objective (50 $\mu g/m^3$)			
				2007	2008	2009	2010
Dalkeith Centre	Dalkeith	N	98.3%	2	0	1	0
Pathhead	Pathhead	Y	91.0%	3	2	2	3

The results indicate that the measured concentrations of PM_{10} at Dalkeith and Pathhead do not exceed the annual mean and 24-hour mean air quality objective for 2010.

The 2010 Further Assessment estimated that within the AQMA at Pathhead the contribution of domestic solid fuel burning to the annual mean PM_{10} concentrations is approximately 3 – 4 ug/m^3.

A gas mains supply is being provided to the village of Pathhead and it is estimated that there will be a significant reduction in PM_{10} levels, provided a sufficient number of households switch from domestic solid fuel to gas. If further periods of monitoring confirm a sustained reduction in PM_{10} then it may be possible to revoke the AQMA.

2.2.3 Sulphur Dioxide

The results of the automatic monitoring are set out in Table 2.6.

Table 2.6 Results of SO_2 Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA?	Data capture	Number of exceedences of		
				15-minute Objective (266 μg/m^3)	1-hour Objective (350 μg/m^3)	24-hour Objective (125 μg/m^3)
Dalkeith Centre	Dalkeith	N	94.6% - 96.7%	0	0	0
Pathhead	Pathhead	N	96.2% - 98.6%	0	0	0

The results indicate that the air quality objectives for sulphur dioxide are complied with at both monitoring stations.

Following submission of Midlothian Council's 2010 Progress Report, the Scottish Environmental Protection Agency commented that as the measured levels of SO_2 were low and exceedance of the air quality objective was unlikely continued monitoring of this pollutant was no longer necessary. Consideration will therefore be given to ceasing monitoring of SO_2 at the end of the 2011 monitoring period.

2.2.4 Summary of Compliance with Air Quality Objectives

Summary

The continuous monitoring indicates that the concentrations of nitrogen dioxide, PM_{10} and sulphur dioxide are below the relevant air quality objectives and therefore there is no need to proceed to a Detailed Assessment.

Proposed Further Monitoring

Midlothian Council will continue to monitor nitrogen dioxide, PM_{10} and sulphur dioxide as described above. This information will be fed into Midlothian Council's 2012 Update and Screening Assessment Report.

Consideration will be giving to ceasing monitoring of SO_2.

Midlothian Council has resumed gravimetric PM_{10} monitoring in Pathhead and will continue this monitoring throughout 2011.

3 New Developments

New developments have the potential to affect air quality in a number of ways. This can include direct emissions to atmosphere from new industrial processes; changes in traffic flow, compositions and speeds associated with new residential and commercial developments; and changes in traffic flow brought about by alterations to road layouts or addition of new roads.

Within Midlothian, there have been some changes to industrial processes and new or planned developments. These are described below:

3.1 Industrial Processes

Information on any new or proposed installations or installations with significant increases in emissions was obtained from SEPA. The list of permitted installations in Midlothian is provided in Appendix B.

3.1.1 New processes

Auchencorth Moss open cast mine was granted a permit. This site borders the boundary between Scottish Borders Council and Midlothian. This facility is not operating as yet as it is scheduled to take over, in part, from the Newbigging open cast coal mine, which is in Midlothian but still operational at present.

3.1.2 Future or Potential New processes

The Scottish Coal Company Ltd planning application for the Airfield Farm opencast coal mining site, as described in the Progress Report 2008, was refused planning permission.

A new concrete batching plant is proposed at Butterfield Industrial Estate, Newtongrange. An amended application in respect of the plant is currently going through the planning process. If granted permission this will require to be licensed by SEPA.

An application for planning permission in principal has been submitted, but not yet determined, for a zero waste facility at Millerhill. If granted permission, this would be in close proximity to the nearby site zoned for housing at Shawfair.

3.1.3 Substantially Varied Processes

There are no substantially varied processes in Midlothian.

3.2 Commercial and Residential Developments

The previously reported planned new town of Shawfair, on the northern edge of Midlothian has not yet commenced construction.

A new mixed residential /commercial development has been granted planning permission at Fordel, near the village of Cousland, although works in relation to this site have not yet commenced.

The new Community Hospital in Bonnyrigg opened in 2010. This is fuelled by means of a gas boiler and an oil boiler provided, which will only be used in emergencies. Due to the likely infrequent use of the oil fired boiler it is not anticipated to cause any air quality issues.

3.3 Road and Rail Infrastructure Developments

There are currently no new roads being planned in Midlothian.

The Waverley line, which was described in the 2008 Progress Report has not yet commenced construction. Some works have however taken place to strengthen bridges along the route of the railway, in preparation for the works which are anticipated to commence in late summer 2012.

3.4 Vehicle Emission Testing

Midlothian Council, in conjunction with other councils, has continued to carry out free roadside vehicle emissions tests during 2010. The aim of the scheme is to give feedback to motorists on whether or not their vehicles meet the required emission limits and to educate and inform motorists about the importance of ensuring the vehicles they drive are well maintained and produce the minimum amount of pollutants. Advising drivers on possible causes for failing the test will allow them to have the necessary repairs and maintenance carried out which would potentially improve their vehicle's emissions of combustion products such as nitrogen dioxide and PM_{10}.

4 Conclusions and Proposed Actions

The conclusions and proposed actions from this Progress Report are set out below:-

4.1 Progress Report

Monitoring inside the Pathhead AQMA

Monitoring of PM_{10} was carried out in 2010 by the Pathhead automatic monitoring station. The results meet but do not exceed the 2010 annual mean objective value.

It is proposed to retain the AQMA and continue to monitor trends throughout 2011 and beyond. It is anticipated that the new gas mains at Pathhead will make a significant improvement to PM_{10} levels, provided a sufficient number of households connect to the new supply. PM_{10} results will continue to be monitored throughout 2011 and will be discussed in more detail in the 2012 Update and Screening Report.

Monitoring of sulphur dioxide was also carried out by the Pathhead automatic monitoring station. The results are well below the air quality objective values. However, the measured concentrations were higher than those recorded in Dalkeith, indicating that domestic solid fuel combustion is contributing to sulphur dioxide concentrations at the monitoring station location. Measurements of sulphur dioxide will continue to input into the LAQM assessment during 2011 although consideration will be given to ceasing monitoring of SO_2 at the end of the 2011LAQM period.

Monitoring outside the Pathhead AQMA

Monitoring of nitrogen dioxide, PM_{10} and sulphur dioxide was carried out at the Dalkeith Centre automatic monitoring station. The results were within the relevant air quality objectives.

Monitoring of nitrogen dioxide was carried out at several locations across Midlothian using diffusion tubes. The results indicated that concentrations measured adjacent to busy roads at all locations are within the annual mean air quality objective. The results indicate that there has been a significant decrease in nitrogen dioxide concentrations at some of the locations within Dalkeith adjacent to the A68 in comparison to the measured concentrations at some of these locations in 2008, which were above the annual mean objective. The decrease is due to the opening of the Dalkeith Bypass which is diverting traffic around the centre of Dalkeith. Some changes to the existing nitrogen dioxide diffusion tube monitoring locations were implemented by Midlothian Council for the 2009 monitoring period. There changes were retained during the 2010 monitoring period.

A Detailed Assessment was undertaken in 2009 in relation to nitrogen dioxide levels at Bonnyrigg town centre. The results were within the air quality objective by some margin. The additional NO_2 tubes installed at this location continue to show levels well below the air quality objective.

No other issues have been identified which would warrant a Detailed Assessment at this time.

New Developments

No significant issues were identified in relation to industrial sources or commercial/residential developments.

4.2 Proposed Actions

The next course of action for Midlothian Council in the Review and Assessment process is summarised as:

- Submit Update and Screening Assessment Report by the end of April 2012.
- Submit an Air Quality Action Plan

5 References

1. Defra and the Devolved Administrations, Local Air Quality Management, Technical Guidance LAQM.TG(09), February 2009.

2. Defra and the Devolved Administrations, Volatile Correction Model, July 2008, correction on 2010 data carried out by AEA Technology under data management contract to the Scottish Government.

3. Defra and the Devolved Administrations, Spreadsheet of Bias Adjustment Factors, version 06/11, accessed at www.uwe.ac.uk/aqm, June 2011.

Appendices

Appendix A QA/QC Data

Appendix B Industrial Processes in Midlothian

Appendix C Ratified Data for Pathhead

Appendix D Ratified Data for Dalkeith

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The diffusion tubes are analysed by Edinburgh Scientific Services using the 50% triethanolamine (TEA) in acetone method. The bias adjustment factor for this laboratory and method for the year 2010 listed in the Spreadsheet of Bias Adjustment Factors v.06/11 (Ref. 3) is 1.02. This is based on a co-location study at a Roadside site carried out by West Lothian Council and a kerbside co-location study at Marylebone Road.

Factor from Local Co-location Studies (if available)

A local co-location study was carried out by Midlothian Council. Three diffusion tubes were located adjacent to the inlet of the Dalkeith Centre automatic monitoring station – tubes J1 (1, 2 and 3) as detailed in Table 2.2. The bias adjustment factor for 2010 was calculated as 0.76 using this study. The bias adjustment calculations are shown below.

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	06/01/2010	03/02/2010	34.3	35.0	31.3	34	2.0	6	4.9	28.7	99.6	Good	Good
2	03/02/2010	03/03/2010	44.6	42.8	34.8	41	5.2	13	13.0	33.7	99.6	Good	Good
3	03/03/2010	31/03/2010	30.9	30.9	33.9	32	1.7	5	4.3	22.7	90.9	Good	Good
4	31/03/2010	28/04/2010	28.1	25.2	25.5	26	1.6	6	4.0	17.4	97.8	Good	Good
5	28/04/2010	02/06/2010	23.8	21.3	26.7	24	2.7	11	6.7	17.4	99.2	Good	Good
6	02/06/2010	30/06/2010	27.2	25.0	23.8	25	1.7	7	4.3	16.4	99	Good	Good
7	30/06/2010	04/08/2010	17.0	18.3	18.8	18	0.9	5	2.3	14.4	99.2	Good	Good
8	04/08/2010	01/09/2010	23.5	23.5	22.7	23	0.5	2	1.1	18.3	99.5	Good	Good
9	01/09/2010	29/09/2010	27.0	28.4	28.6	28	0.9	3	2.2	21.9	99.2	Good	Good
10	29/09/2010	03/11/2010	25.8	28.5	29.2	28	1.8	6	4.5	22.0	99.1	Good	Good
11	03/11/2010	01/12/2010	n/a	n/a	n/a					25.1	99.7		Good
12	01/12/2010	05/01/2011	n/a	n/a	n/a					39.2	99.3		Good
13													
										Overall survey -->		Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

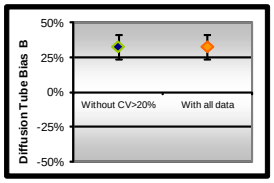
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 10 out of 10 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.76 (0.71 - 0.82)
Bias B	31% (22% - 40%)
Diffusion Tubes Mean:	28 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	21 (20 - 23) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	0.76 (0.71 - 0.82)
Bias B	31% (22% - 40%)
Diffusion Tubes Mean:	28 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	21 (20 - 23) μgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Discussion of Choice of Factor to Use

The results of the diffusion tube measurements were adjusted using the bias adjustment factor derived from Midlothian Council's own co-location study. This was chosen as the diffusion tube precision and data capture from the Midlothian study was good.

PM_{10} Monitoring Adjustment

The TEOM PM_{10} measurements for the Dalkeith Centre and Pathhead automatic monitoring stations were adjusted using the Volatile Correction Method (VCM) as recommended in LAQM.TG(09). These adjustments were carried out by AEA Technology.

A description of the data correction method used by AEA Technology for the 2010 data period was provided by AEA Technology and is set out below.

Introduction

AEA has been funded by The Scottish Government to provide Volatile Correction Model (VCM) corrected TEOM (Tapered Element Oscillating Microbalance) data to Local Authorities under the Scottish Air Quality Database and Website (SAQD) project.

The VCM uses purge (volatile) particulate matter measurements provided by FDMS (Filter Dynamics Measurement System) instruments located within 130 km of the TEOM in question to assess the loss of particulate matter (PM_{10}) from the TEOM. The TEOM measurements, without the applied USEPA correction factors of 1.03x+3 (where x is the raw TEOM measurement), are then corrected to ambient pressure and temperature using meteorological data from met monitoring sites within 260 km of the TEOM. The volatile fraction is then added back onto the TEOM measurements to give Gravimetric Equivalent mass concentrations.

This is a short summary outlining the method used by AEA for correcting the 2010 Scottish TEOM data in the Scottish database.

4.2 Method

The following data have been used as inputs to the VCM:

- Hourly average temperatures (°C)
- Hourly average pressures (mbar)
- Hourly average TEOM concentrations ($\mu g\ m^{-3}$)
- Hourly average FDMS purge concentrations ($\mu g\ m^{-3}$)

Hourly average temperatures from Edinburgh Airport and pressures measurements from Edinburgh Gogarbank meteorological monitoring stations were used in the model. These sites were selected as a good representation the weather in the central belt of Scotland and are also located approximately 150 km from Aberdeen, which is within the specified 260 km limit.

Hourly average purge measurements from all Scottish FDMS monitoring sites within the Scottish Government-run network (SAQD) and the national network (AURN) were used for the correction. Table 1 lists the sites used for correcting hourly TEOM data from Central Scotland and Aberdeen. A total of 4 FDMS sites were used for correcting Aberdeen TEOM data and 26 FDMS sites used for correcting data from TEOM sites located in the central belt of Scotland.

Any outliers in the FDMS purge measurements were identified using Grubbs' Test[1] on daily average data. All hourly data within a day identified as an outlier were then removed from the data set and the average of each hourly purge measurement from the FDMS sites was calculated and used in the VCM calculations.

[1] Grubbs' Test is a statistical method for identifying outliers within a dataset. For more information visit the Engineering Statistics Handbook at:

http://www.itl.nist.gov/div898/handbook/eda/section3/eda35h.htm

Table 1 FDMS Monitoring Sites used in VCM Correcting TEOM Data from Aberdeen and Central Scotland Monitoring Sites

TEOM Locations	FDMS Sites used in VCM	Monitoring Network
Aberdeen	Aberdeen PM_{10}	AURN
	Aberdeen $PM_{2.5}$	AURN
	Angus Forfar	SAQD
	Fife Cupar	SAQD
Central Scotland	Angus Forfar	SAQD
	Auchencorth Moss PM10	AURN
	Auchencorth Moss PM25	AURN
	East Dunbartonshire Kirkintilloch	SAQD
	East Renfrewshire Sheddens	SAQD
	Edinburgh St Leonards PM_{10}	AURN
	Edinburgh St Leonards $PM_{2.5}$	AURN
	Fife Cupar	SAQD
	Fife Rosyth	SAQD
	Glasgow Abercromby Street	SAQD
	Glasgow Broomhill	SAQD
	Glasgow Centre PM_{10}	AURN
	Glasgow Centre $PM_{2.5}$	AURN
	Glasgow Kerbside PM_{10}	AURN
	Glasgow Kerbside $PM_{2.5}$	AURN
	Glasgow Nithsdale Road	SAQD
	Grangemouth PM_{10}	AURN
	Grangemouth $PM_{2.5}$	AURN
	Paisley Gordon Street	SAQD
	Paisley St James St	SAQD
	South Lanarkshire East Kilbride	SAQD
	South Lanarkshire Raith Interchange	SAQD
	West Dunbartonshire Clydebank	SAQD
	West Lothian Broxburn	SAQD
	West Lothian Linlithgow High Street	SAQD
	West Lothian Whitburn	SAQD

VCM and the SAQD

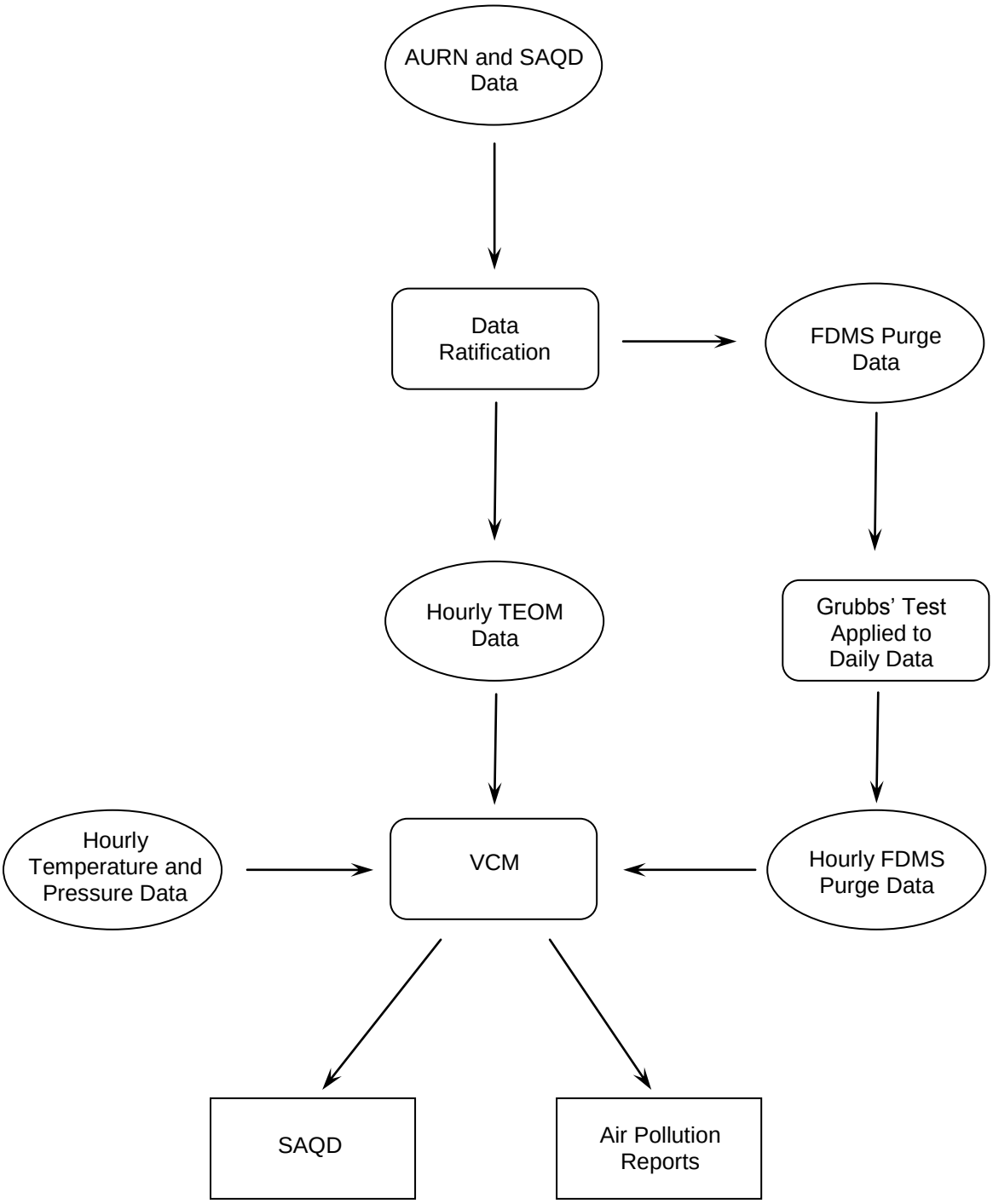
All VCM corrected data have been made available on the SAQD website via an additional selection option in the data download pages. The Air Pollution reports provided to all Local Authorities now include VCM corrected PM_{10} statistics. If a PM_{10} analyser has been upgraded to an FDMS from a TEOM during 2010, the statistics quoted are calculated using the combination of VCM corrected data and FDMS data.

A flow chart showing the overall process employed for VCM correcting 2010 SAQD TEOM data is shown below.

Midlothian Council

Progress Report

Process used for VCM Correcting SAQD TEOM Data



QA/QC of automatic monitoring

Details of the QA/QC of automatic monitoring are provided in Chapter 2.

QA/QC of diffusion tube monitoring

Details of the QA/QC of diffusion tube monitoring are provided in Chapter 2.

Appendix B: List of Industrial Processes

License Number	Operator	Site	Regulation Category	Schedule 1 Activity	Section
PPC/E/0020007	Waste Recycling Group Ltd	Drummond Moor (No2) Landfill Site, Penicuik	Part A	Chapter 5: Waste Management	5.2.a
PPC/E/0020034	Interflex Ltd	Peggy's Mill, Edinburgh	Part A	Chapter 6: Other Activities	6.4.b
PPC/E/0020082	Deans Foods	Loanhead Processing Plant	Part A	Chapter 6: Other Activities	6.8.d.(i)
PPC/B/1003133	N.C.R.C Heggie (Edinburgh) Ltd	Unit C, Pentland Industrial Estate	Part B	Chapter 6: Other Activities	6.4.b
PPC/B/1003236	Brand and Rae Ltd	Bonnyrigg Ready Mix Concrete Plant, Bonnyrigg	Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/B/1004347	Scottish Coal	Millerhill Disposal Point, Edinburgh	Part B	Chapter 3: Mineral Industries	3.5.b.(i)
PPC/B/1004359	Hanson Premix	Nivensknowe Rd, Loanhead	Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/B/1009121	Tarmac Northern	Old Pentland, Midlothian	Part B	Chapter 3: Mineral Industries	3.5.e
PPC/B/1010425	W & J Short	Dalkeith	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1010428	Sainsbury's	Petrol filling station	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1010582	Esso	Fordel Service Station, Lauder Road, Dalkeith	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1010585	Hay`s of Penicuik	Penicuik	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1012932	Johnsons	Sainsburys Loanhead	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1013309	Shell	Newtonloan	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1014758	Crawford Drycleaning Services	Bonnyrigg	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1014928	Drycleaning & Laundry Services	Dalkeith	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1015551	RFA-em Co. Ltd	Bilston Glen, Loanhead	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1016238	Leiths (Scotland) Ltd		Part B	Chapter 3: Mineral Industries	3.5.e
PPC/B/1016238	Leiths (Scotland) Ltd		Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/B/1018366	Q4 Drycleaning	Penicuik	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities

Table of industrial processes (continued)

License Number	Operator	Site	Regulation Category	Activity	Section
PPC/E/0030016	Esso	Lothianburn Service Station	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/E/0030019	Shell	Easthouses	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/E/0030068	Tarmac Northern Ltd	Catewell Quarry - Dalkeith	Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/E/0030073	Howie Minerals Ltd	Middleon Limeworks	Part B	Chapter 3: Mineral Industries	3.5.a
PPC/E/0030122	Scottish Coal Company Ltd	Newbigging OCCS - Rosewell	Part B	Chapter 3: Mineral Industries	3.5.b.(ii)
PPC/E/0030122	Scottish Coal Company Ltd	Newbigging OCCS - Rosewell	Part B	Chapter 3: Mineral Industries	3.5.b.(i)
PPC/E/0030122	Scottish Coal Company Ltd	Newbigging OCCS - Rosewell	Part B	Chapter 3: Mineral Industries	3.5.b.(iii)
PPC/E/0030147	Tesco	Tesco Filling Station	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/E/0030154	The Moredun Foundation	Pentlands Science Park, Penicuik	Part B	Chapter 5: Waste Management	5.1.a
PPC/B/1033591	Scottish Coal Company Ltd.	Auchencorth OCCS - Harlawmuir,NR Penicuik	*Part B*	Chapter 3: Mineral Industries	3.5.b.(ii)

APPENDIX C Ratified Data for Pathhead

MIDLOTHIAN PATHHEAD
1st January to 31st December 2010

These data have been fully ratified by AEA

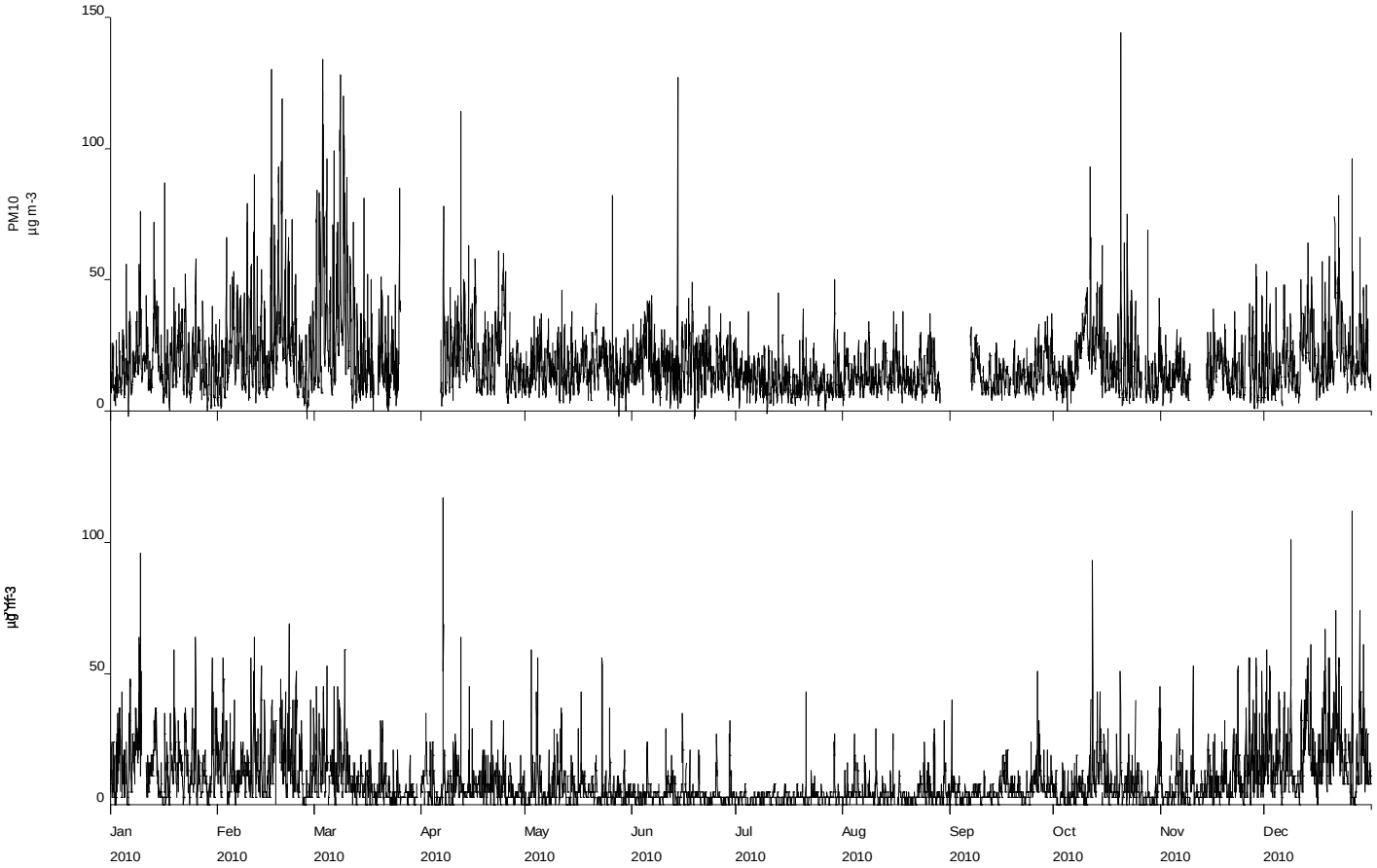
POLLUTANT	PM_{10}*+	SO_2
Number Very High	0	0
Number High	0	0
Number Moderate	0	0
Number Low	7987	33098
Maximum 15-minute mean	144 µg m^{-3}	194 µg m^{-3}
Maximum hourly mean	144 µg m^{-3}	117 µg m^{-3}
Maximum running 8-hour mean	108 µg m^{-3}	55 µg m^{-3}
Maximum running 24-hour mean	60 µg m^{-3}	43 µg m^{-3}
Maximum daily mean	57 µg m^{-3}	38 µg m^{-3}
Average	18 µg m^{-3}	9 µg m^{-3}
Data capture	91.0 %	95.5 %

* PM_{10} as measured by a TEOM using the VCM for Gravimetric Equivalent
All mass units are at 20°C and 1013 mb

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	3	3
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0

Produced by AEA on behalf of the Scottish Government

Midlothian Pathhead Air Monitoring
Hourly Mean Data for 1st January to 31st December 2010



APPENDIX D Ratified Data for Dalkeith

MIDLOTHIAN DALKEITH
1st January to 31st December 2010

These data have been fully ratified by AEA

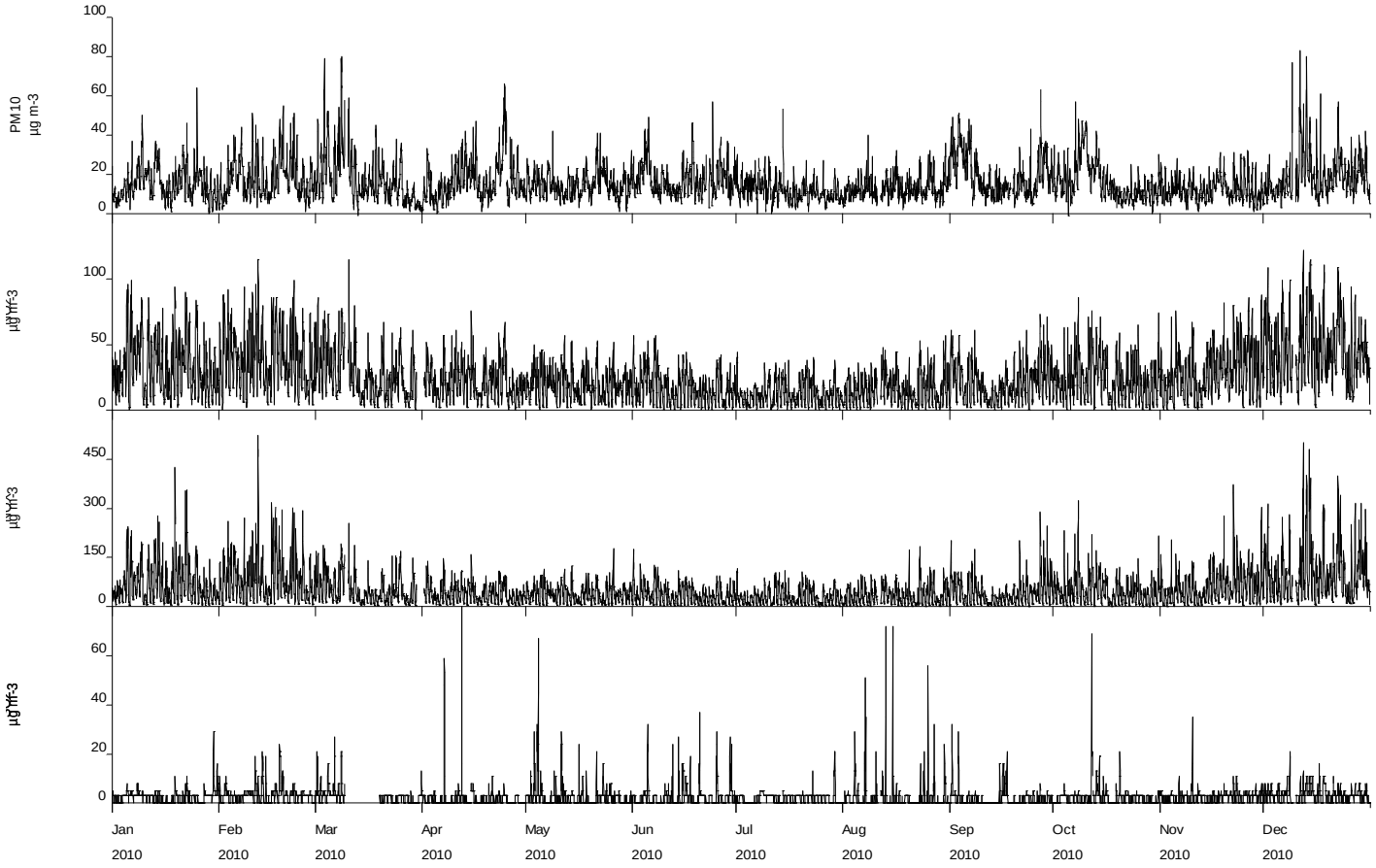
POLLUTANT	PM_{10}*	NO_2	NO_X	SO_2
Number Very High	0	0	-	0
Number High	0	0	-	0
Number Moderate	0	0	-	0
Number Low	8582	8577	-	32989
Maximum 15-minute mean	83 µg m^{-3}	201 µg m^{-3}	795 µg m^{-3}	141 µg m^{-3}
Maximum hourly mean	83 µg m^{-3}	122 µg m^{-3}	523 µg m^{-3}	80 µg m^{-3}
Maximum running 8-hour mean	66 µg m^{-3}	105 µg m^{-3}	348 µg m^{-3}	44 µg m^{-3}
Maximum running 24-hour mean	50 µg m^{-3}	80 µg m^{-3}	235 µg m^{-3}	16 µg m^{-3}
Maximum daily mean	41 µg m^{-3}	75 µg m^{-3}	224 µg m^{-3}	16 µg m^{-3}
Average	16 µg m^{-3}	25 µg m^{-3}	52 µg m^{-3}	2 µg m^{-3}
Data capture	98.3 %	97.9 %	97.9 %	95.9 %

* PM_{10} as measured by a TEOM using the VCM for Gravimetric Equivalent
All mass units are at 20°C and 1013 mb
NO_X mass units are NO_X as NO_2 µg m^{-3}

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0

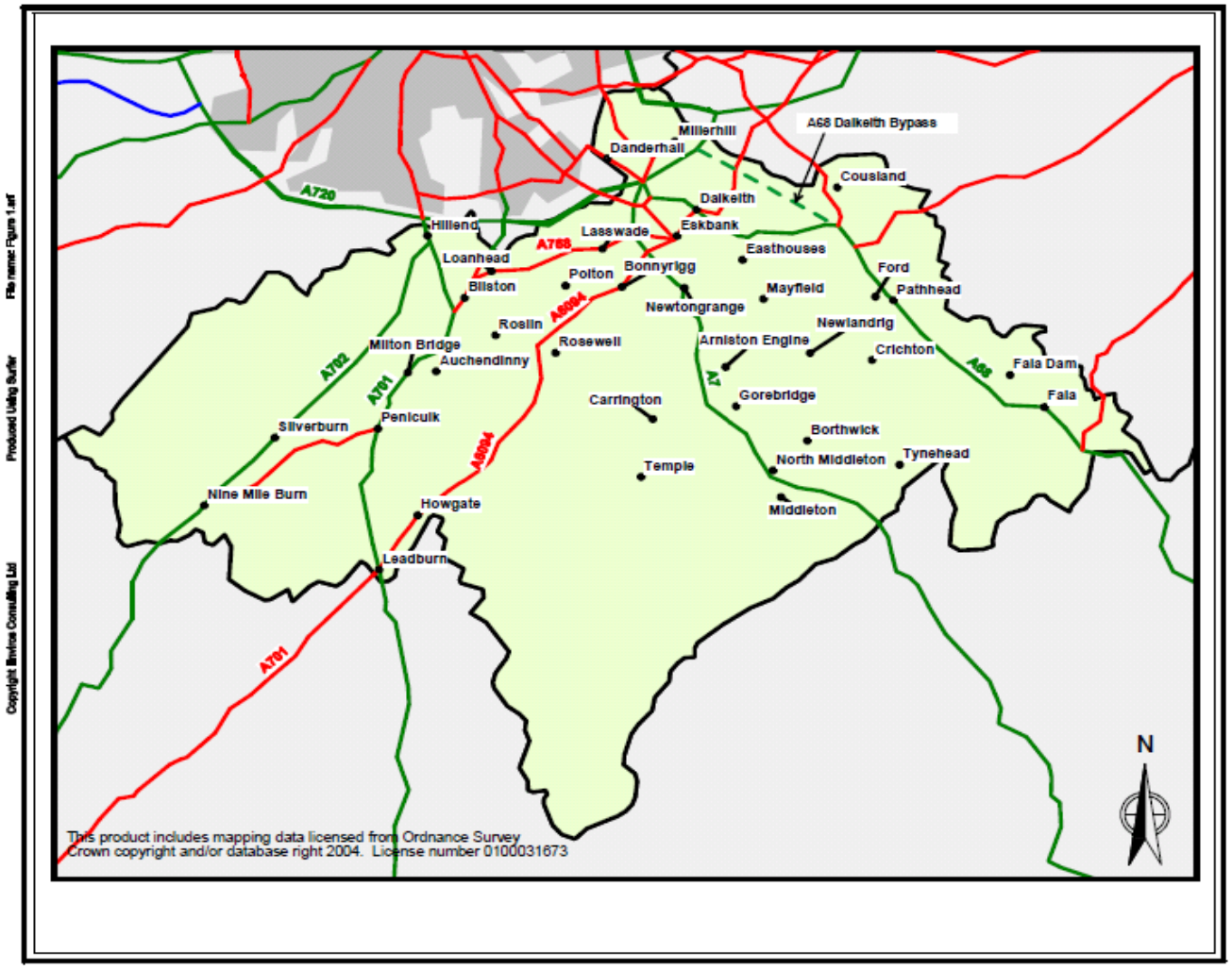
Produced by AEA on behalf of the Scottish Government

Midlothian Dalkeith Air Monitoring
Hourly Mean Data for 1st January to 31st December 2010



Figures

Figure 1 - Schematic showing boundary of Midlothian, including towns, villages and significant roads



Midlothian

Figure 2 Air Quality Management Area, Pathhead

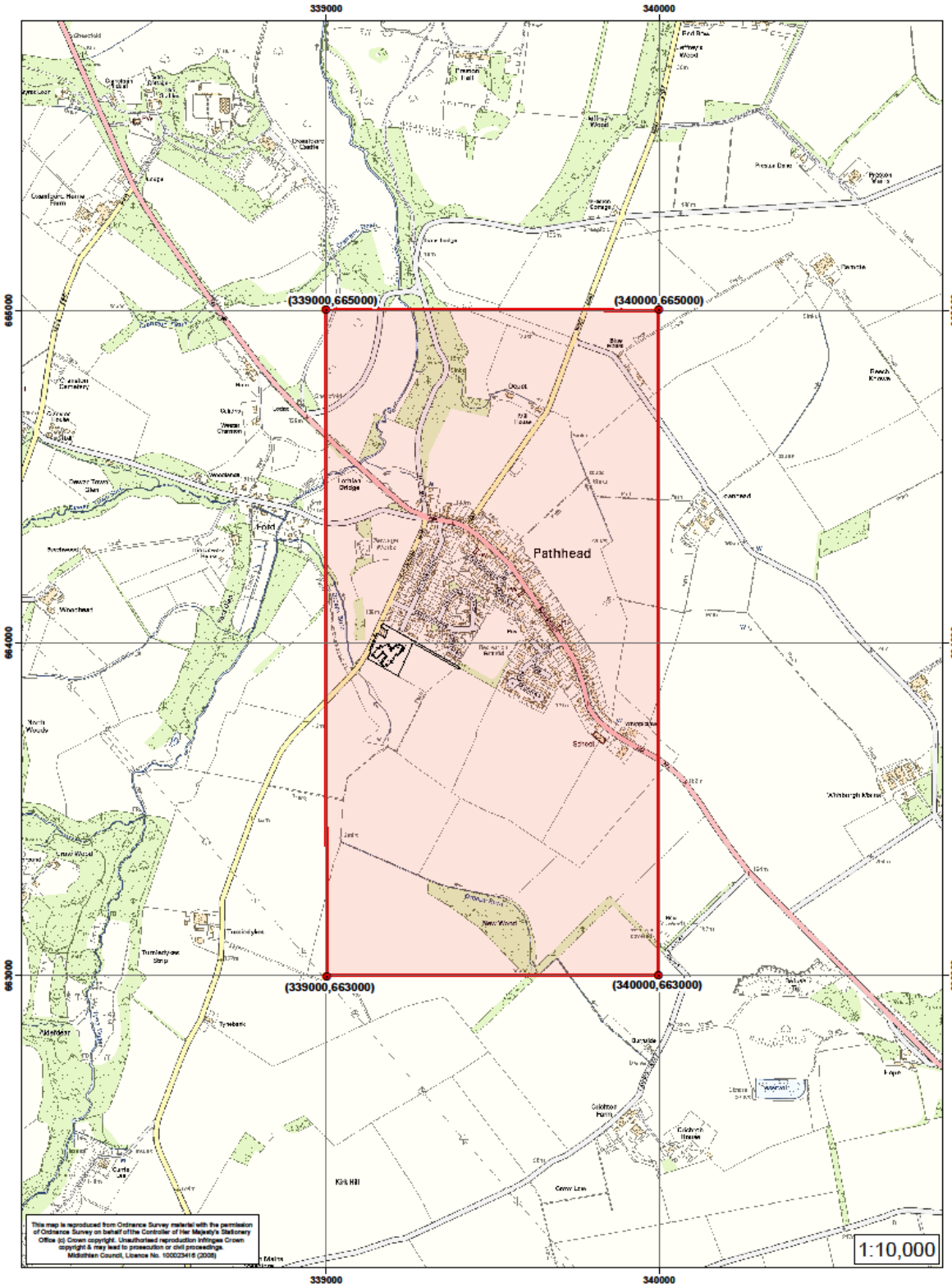


Figure 3 Location of automatic monitoring station and passive diffusion tubes in Dalkeith

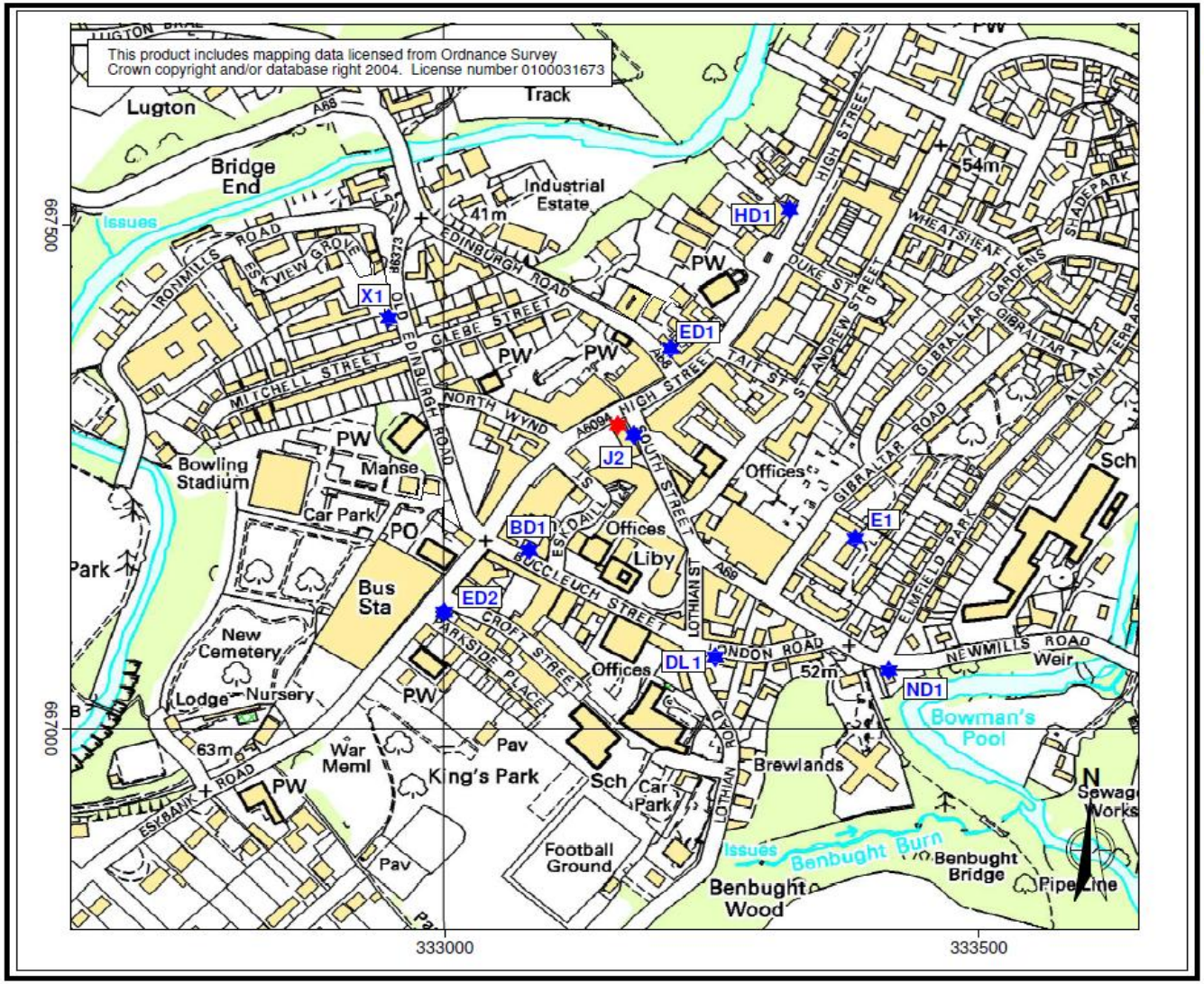


Figure 4 Location of automatic monitoring station and passive diffusion tubes in Pathhead

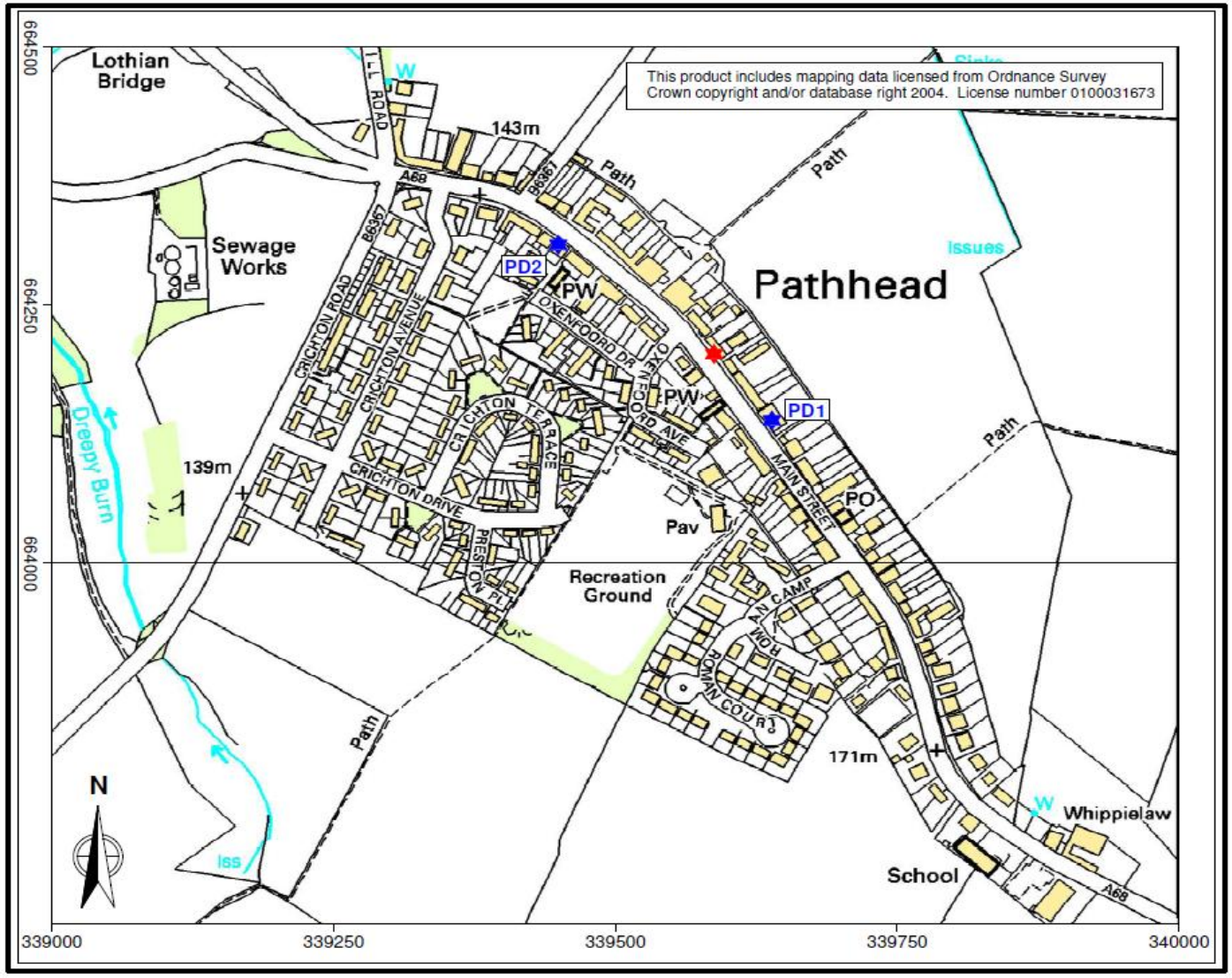


Figure 5 Location of passive diffusion tubes in Penicuik

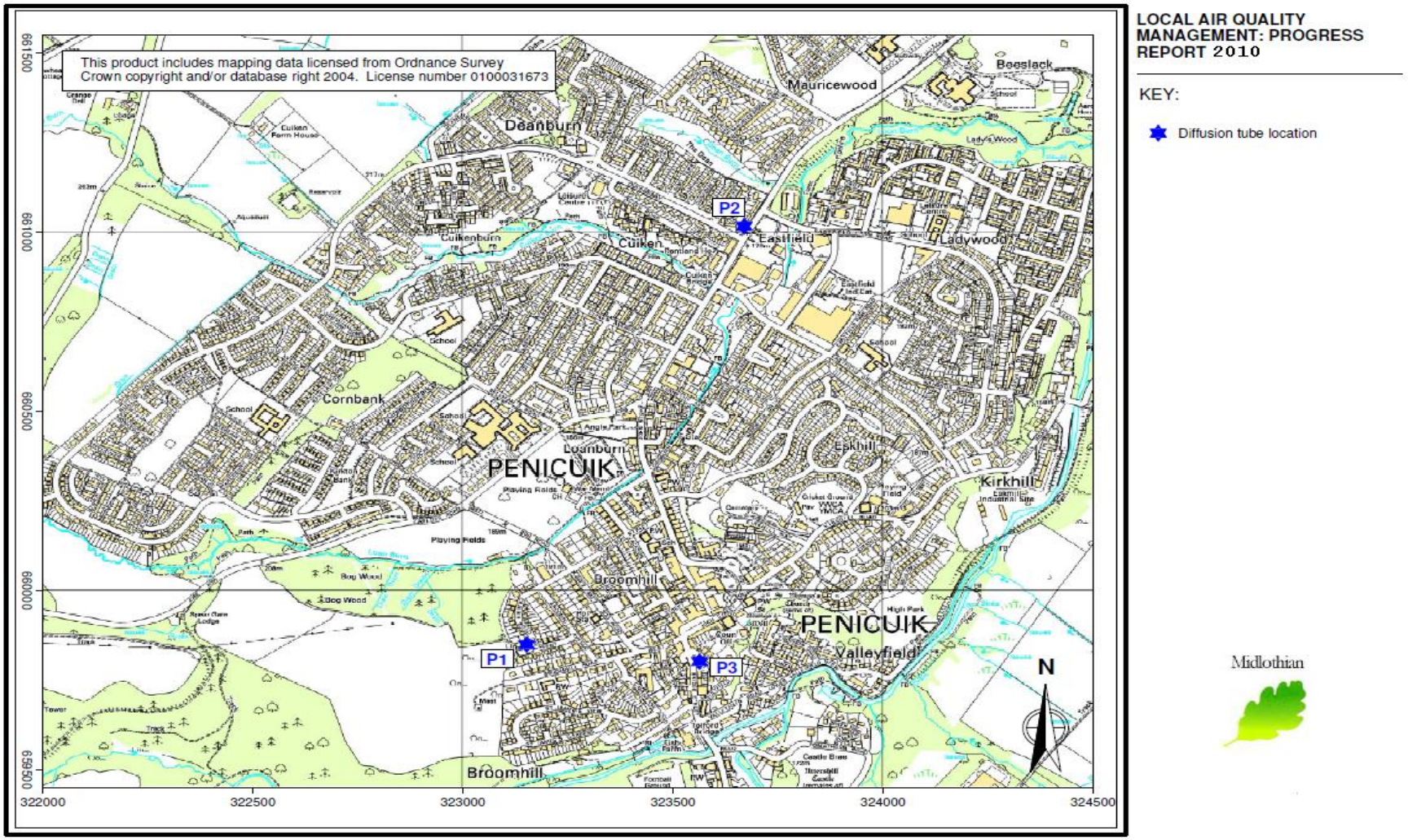


Figure 6 Location of passive diffusion tubes in Bonnyrigg

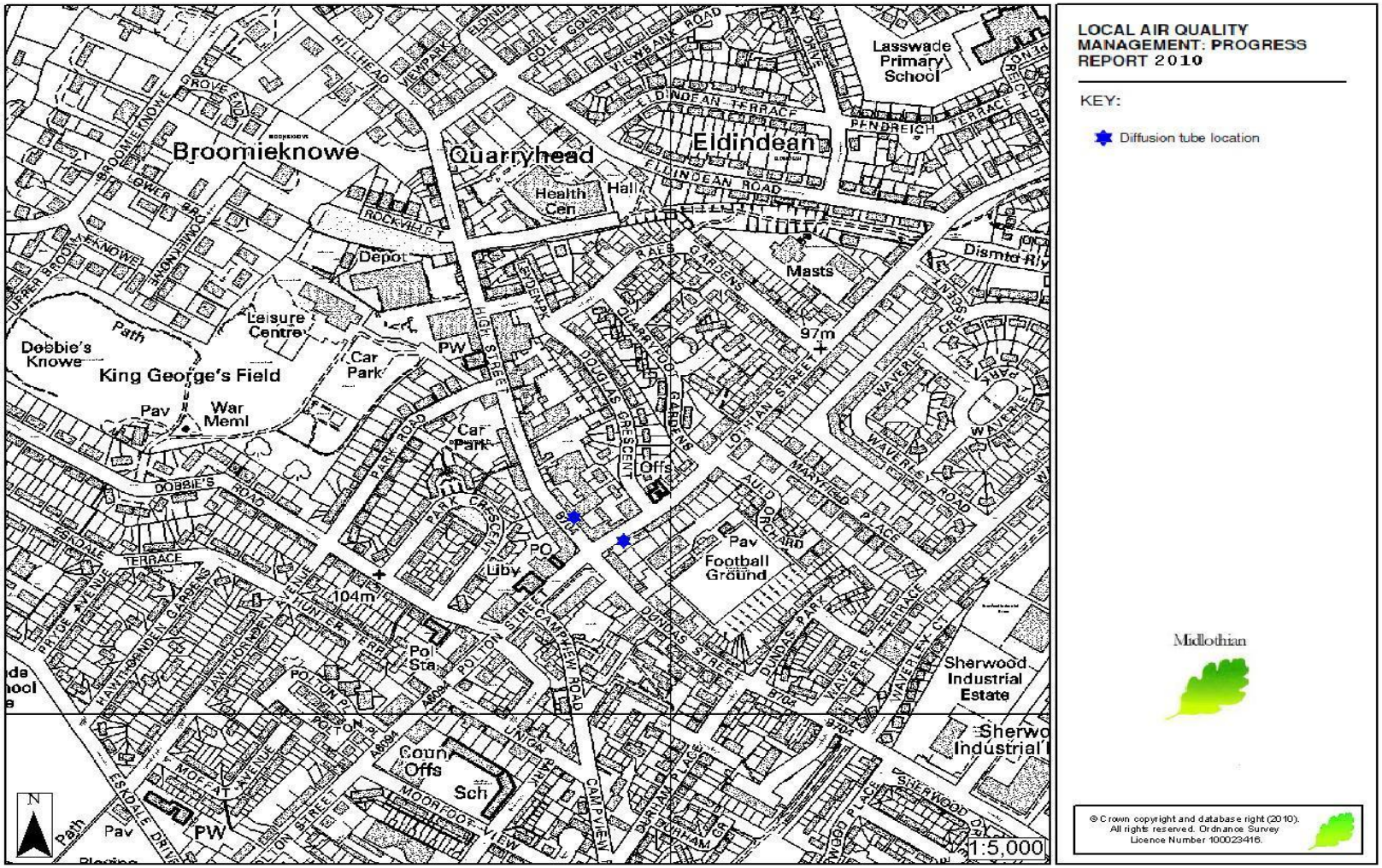


Figure 7 Location of passive diffusion tubes in Loanhead

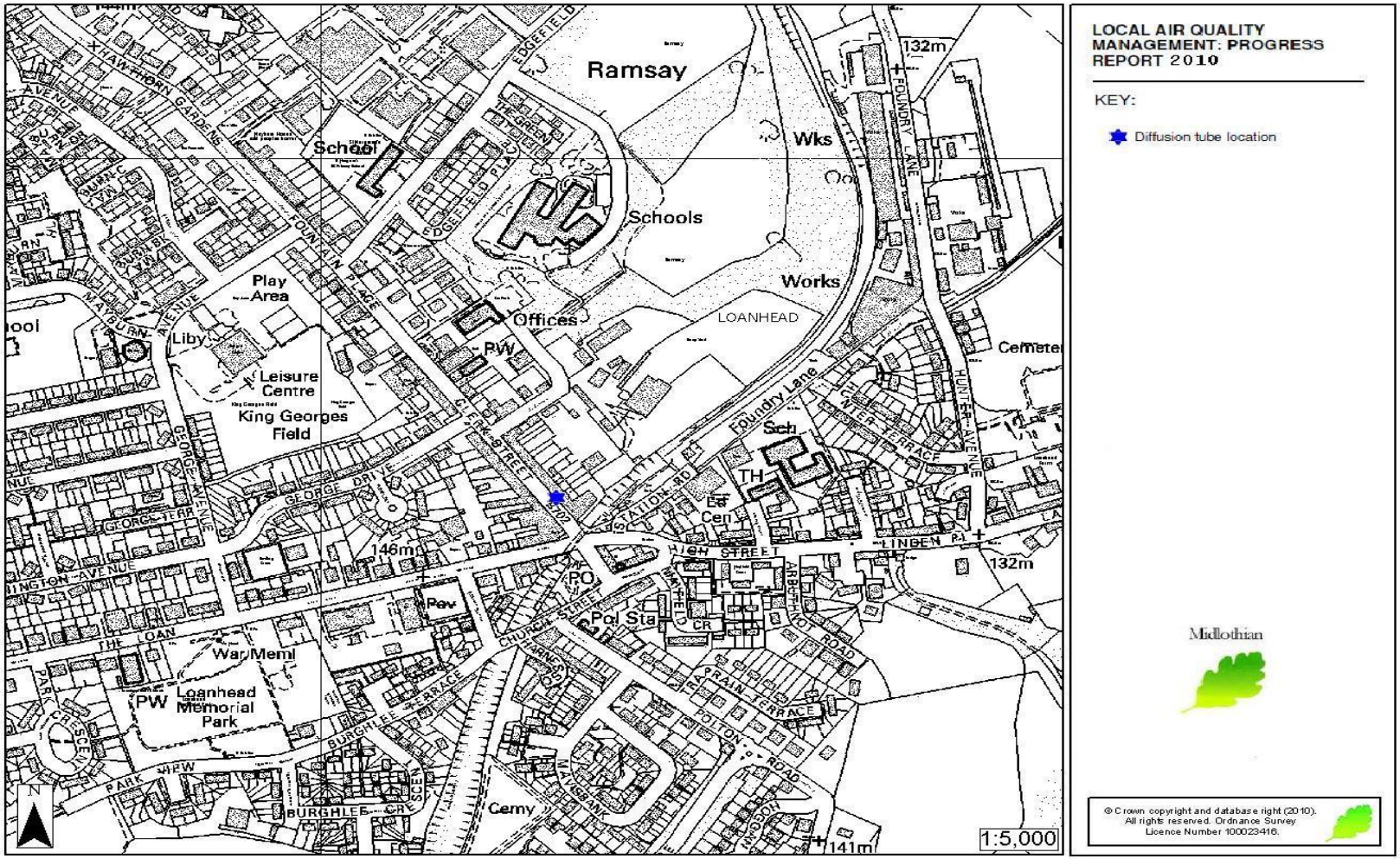


Figure 8 Annual mean nitrogen dioxide diffusion tube concentrations in Midlothian 2003 – 2010